OCT 13 1941

ENGINEERING NEWS-RECORD

October 9, 1941

CE

imber roof trusses with columns attached ready for erection at Boeing Aircraft's Vancouver plant.—See p. 64

An Approach to Fluid Mechanics
Army Tries Out Cableway Bridge
New England Water Works Meeting
Drainage for Grade Separations

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Smoke corrosion is an every-day problem with railroad engineers . . . and they know from three quarters of a century of accumulated experience what the most durable, dependable and economical solution is. These six 30"x 50' stacks at the Boston Fruit Terminal of the New York, New Haven and Hartford Railroad Company are Byers Wrought Iron.

Many engineers take it for granted that frequent replacement of metal stacks is natural and unavoidable. This is a mistaken idea, as the experience of hundreds of wrought iron users proves. For instance—at one plant, stacks of ordinary materials that had lasted between 2½ and 3 years were replaced with wrought iron in 1933. The wrought iron stacks are still serving. At another, the top section of a 30-year-old wrought iron stack was replaced with a low-first-cost metal, which failed in only five years. The second replacement was naturally wrought iron . . . and it and the original wrought iron lower sections are still on the job.

Conditions today make stack failures more expensive and more serious than usual. If you have any flue-gas conductors, or coal storage or handling equipment, where ordinary materials do not last, our Engineering Service Department will be glad to give you actual field data on the performance of wrought iron under similar conditions. Ask, also, for our bulletin, "Wrought Iron for Flue Gas Conductors and Coal Handling Equipment," which discusses various smoke corrosion problems, and gives examples of their solution.

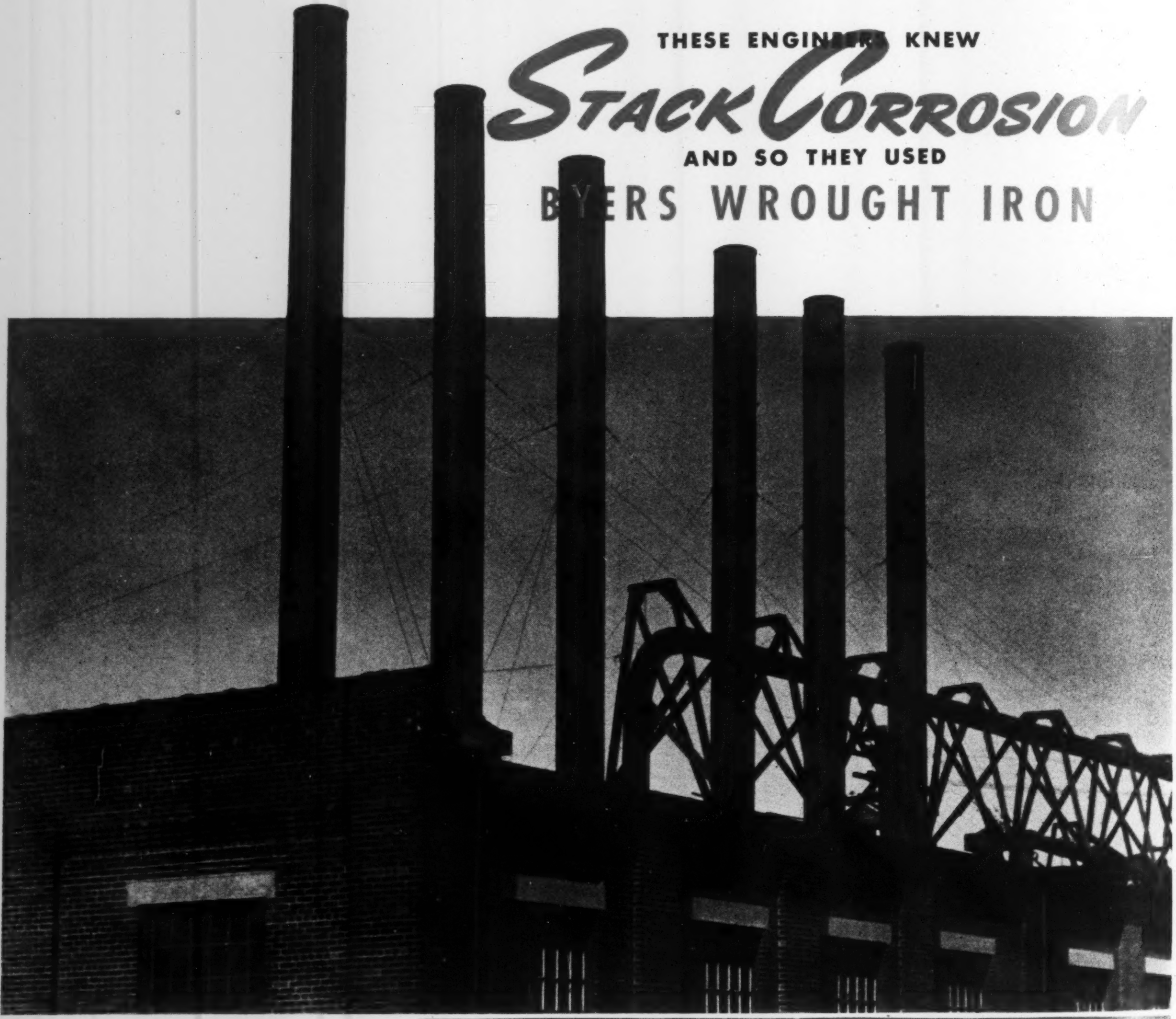
A. M. Byers Co., Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Chicago, St. Louis, Houston, Seattle, San Francisco.

THESE ENGINEERS KNEW

STACK CORROSION

AND SO THEY USED

BYERS WROUGHT IRON



Corrosion costs you more than Wrought Iron

BYERS GENUINE WROUGHT IRON

TUBULAR AND HOT ROLLED PRODUCTS

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ENGINEERING NEWS-RECORD

Devoted to Buildings, Sewers, Waterworks, Bridges, Highways, Streets, Dams, Foundations, Earthwork, Flood Control, Public Works, Irrigation, Canals, Railroads

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Vol. 127 OCTOBER 9, 1941 No. 15

THIS WEEK

• Timber, used almost exclusively in the new Boeing Aircraft plant at Vancouver, Canada, described in this issue, effected a considerable saving in steel needed for other wartime use. Of unusual interest was the method of assembling 128-ft. roof trusses and supporting columns on trestles at the rate of five per 8-hr. shift, and lifting the units into place.

• An engineer reviews the development and application of mathematical analysis for the solution of practical hydraulic problems. New concepts and significance of various formulas of the modern school of fluid mechanics are given.

• From fifteen years of experience in providing artificial drainage for highway underpasses, the Illinois Division of Highways has evolved certain basic principles of design that insure efficient operation, low maintenance and low annual cost. These principles are outlined and a typical structure with pumping plant is illustrated.

DEFENSE DEVELOPED BUILDINGS

• A special 32-page section in the October 23 issue will be devoted to a review of the design and construction of some of the more outstandings buildings that have been constructed during 1941 as part of the national defense effort. The Army and Navy have been carrying out a building program of unusual magnitude and there has been corresponding development in building technique, which is of direct interest for all concerned with building design and construction. Structures described in the special section vary from a 20-story naval hospital and the 340x547-ft. home of OPM, to the timber frame sports arenas at Army camps and the windowless concrete storehouse for the famous Air Corps bombsight.

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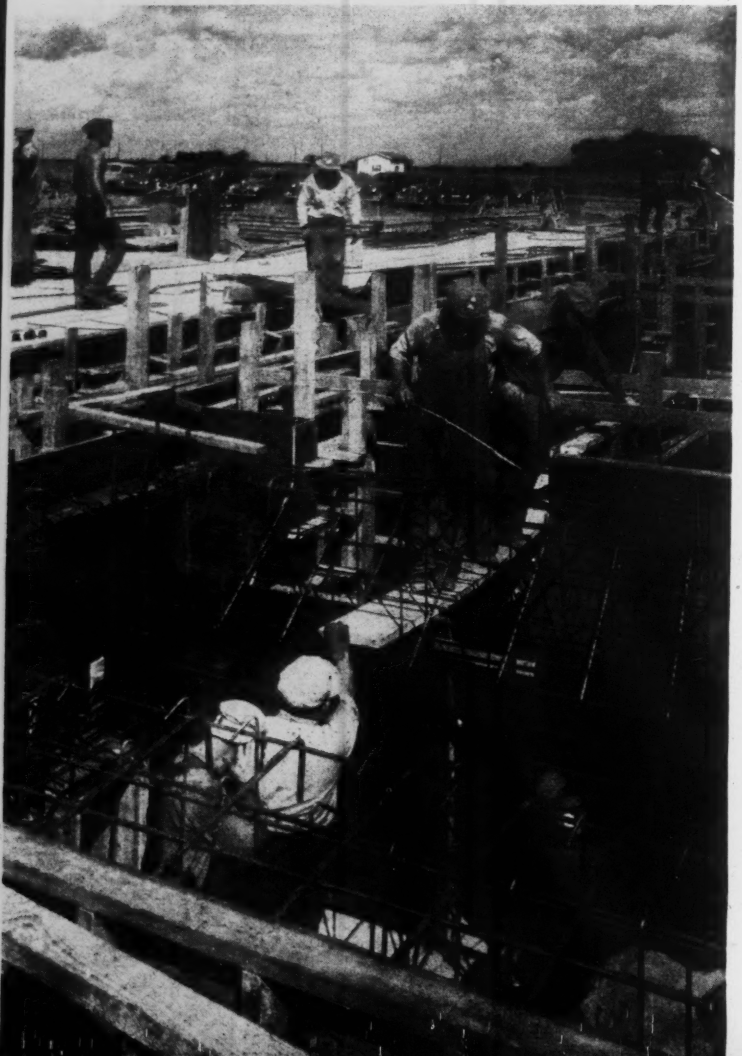
Number of copies of this issue printed: 35,909

Ordnance Plant Progresses "On Schedule" with Ryerson Reinforcing

Over 2,000 tons of Ryerson Reinforcing Bars are being used in building the War Department's new Elwood Ordnance Plant.



● Like thousands of other contractors, Sanderson & Porter—builders of the War Department's new Elwood Ordnance Plant in Joliet, Illinois—depend on Ryerson for prompt "on location" delivery of reinforcing bars and accessories.

Although defense orders come first at Ryerson, we believe that the "tight" steel situation may ease a bit before long, and that it will definitely pay you to check with us whenever you need reinforcing bars, wire mesh, accessories, etc. Bars are accurately cut, bent and tagged according to blue prints and specifications, and deliveries are always coordinated with the progress of the job. Joseph T. Ryerson & Son, Inc. Plants at: Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Buffalo, Cleveland, Boston, Philadelphia, Jersey City.

RYERSON *for* REINFORCING

MONTHLY CONSTRUCTION BUSINESS SUMMARY

ENR CONSTRUCTION VOLUME AND NEW CAPITAL . . . . F H A MORTGAGES

(,000 omitted)	September 1940	September 1941	% Change	Nine Months 1940	Nine Months 1941	% Change
Total Construction	$368,252	$514.251	+40.0	$2.502.973	$4.843.878	+93.5
Private Construction	95,941	73.196	−24.0	731.501	966.938	+32.0
Public Construction	272,311	441.055	+62.0	1.771.472	3,876.940	+118.0
Federal	147,150	363.169	+147.0	705,140	2,911.089	+313.0
Total New Productive Capital	$862,136	$457.416	−47.0	$2,847,467	$5,860.877	+106.0
Private Investment	−183,919†	28.637	......	574,180	656,099	+14.0
Federal (non-federal work)	181,400	250	......	600,060	378,660	−37.0
Federal (federal work)	864,655	428.529	−50.0	1,673,227	4.826.118	+188.0
FHA Mortgages Selected for Appraisal	$116,261	$112.176*	—3.5	$994,056	$1.124,067*	+13.0

†Revised. **Preliminary.*

CONSTRUCTION COSTS . . . . WAGE RATES . . . . PRICES

	October 1940	October 1941	% Change	Change September to October 1940 Sept.	1940 Oct.	%	1941 Sept.	1941 Oct.	%
E N R Construction Cost Index, 1913 = 100	245.02	264.46	+7.9	244.13	245.02	+0.4	263.12	264.46	+0.5
E N R Building Cost Index, 1913 = 100	204.02	215.92	+5.8	203.13	204.02	+0.4	214.58	215.92	+0.6

ENR 20-CITIES' AVERAGE

	October 1940	October 1941	% Change	1940 Sept.	1940 Oct.	%	1941 Sept.	1941 Oct.	%
Common Labor	$0.711	$0.761	+7.0	$0.711	$0.711	0	$0.761	$0.761	0
Skilled Labor (av. 3 trades)	1.480	1.516	+2.4	1.480	1.480	0	1.516	1.516	0
Bricklayers	1.568	1.608	+2.6	1.568	1.568	0	1.608	1.608	0
Structural Ironworkers	1.542	1.582	+2.6	1.542	1.542	0	1.582	1.582	0
Carpenters	1.330	1.358	+2.1	1.330	1.330	0	1.358	1.358	0
Cement, per bbl	$2.52	$2.52	0	$2.52	$2.52	0	$2.52	$2.52	0
Reinforcing steel, per cwt.	2.53	2.59	+2.4	2.52	2.53	+0.4	2.59	2.59	0
Struct. steel shapes, base	2.10	2.10	0	2.10	2.10	0	2.10	2.10	0
Sand, per ton	1.16	1.18	+1.7	1.17	1.16	−0.9	1.18	1.18	0
Lumber, 2x4 Fir, per M ft.	35.88	46.47	+29.5	35.43	35.88	+1.3	44.72	46.47	+3.9
Lumber, 2x4 Pine, per M ft.	33.96	40.71	+19.9	32.77	33.96	+3.6	40.01	40.71	+1.7
Brick, common, per M	14.43	14.91	+3.3	14.43	14.43	0	14.83	14.91	+0.5
Ready-mixed concrete, c.y.	6.94	7.07	+1.9	6.93	6.94	+0.1	7.07	7.07	0
Struct. clay tile, 3x12x12	74.78	76.69	+2.6	74.78	74.78	0	75.99	76.69	+0.9
Paving asphalt, cars, ton	14.21	14.68	+3.3	14.21	14.21	0	14.63	14.68	+0.3

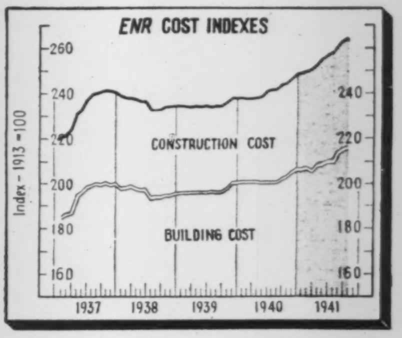
MATERIAL SHIPMENTS . . . . BUILDING PERMITS

	September 1940	September 1941	% Change	July 1941	% Change Aug.-Sept.
Lumber (% 1935–'39 wk. seas. av.) N.L.M.A.	126.3	129.5	+2.5	139.0	−6.8
Steel (% operating capacity) A.I.S.I.	90.0	96.5	+7.2	96.2	+0.3

	August 1940	August 1941	% Change	Eight Months 1940	Eight Months 1941	% Change
Fabricated Structural Steel, tons, A.I.S.C.	134.858	176.057	+30.6	916.990	1.449.408	+58.0
Cement, thous. bbl., U. S. B. of M.	14.018	17.825	+27.2	81.234	106.156	+30.8
Building Permits, Dun & Bradstreet, (,000 omitted)	$116.269	$119.535	+2.8	$890.473	$1.032.991	+16.0

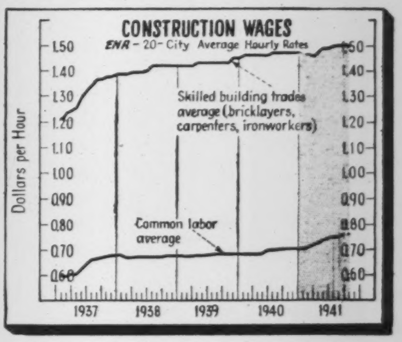
RENT AND COST OF LIVING INDEXES

	August 1940	August 1941	% Change	July 1941	% Change July-Aug.
Rent (Housing) Index, N.I.C.B.	86.9	88.6	+2.0	88.4	+0.2
Cost of Living Index, N.I.C.B.	85.4	89.4	+4.7	88.9	+0.6



ENR INDEX NUMBERS

Base = 100	Construction Cost 1913	Construction Cost 1926	Building Cost 1913	Building Cost 1926	Volume '13	Volume '26
Oct., 1941	264.46	127.13	215.92	116.72		
Sept., 1941	263.12	126.48	214.58	116.00	419	184
Aug., 1941	260.41	125.18	212.45	114.84	434	190
July, 1941	258.18	124.11	210.22	113.64	635	278
June, 1941	256.79	123.44	209.41	113.20	492	216
May, 1941	255.55	122.84	209.24	113.11	275	121
April, 1941	252.40	121.33	208.60	112.76	322	141
Mar., 1941	250.71	120.52	207.88	112.37	386	169
Feb., 1941	250.50	120.42	208.42	112.67	374	164
Jan., 1941	249.69	120.03	207.94	112.46	402	176
Dec., 1940	249.12	119.75	208.19	112.54	344	151
Nov., 1940	247.24	118.85	206.24	111.49	331	145
Oct., 1940	245.02	117.78	204.02	110.29	490	215
Sept., 1940	244.13	117.35	203.13	109.83	324	142
1940 (Av.)	241.96	116.31	202.81	109.64	269	118
1939 (Av.)	235.51	113.21	197.44	106.73	211	92
1938 (Av.)	235.86	113.34	196.83	106.40	197	86
1937 (Av.)	234.71	112.66	196.15	106.07	172	75



ENGINEERING CONSTRUCTION CONTRACTS——ENGINEERING NEWS-RECORD——SEPTEMBER, 1941

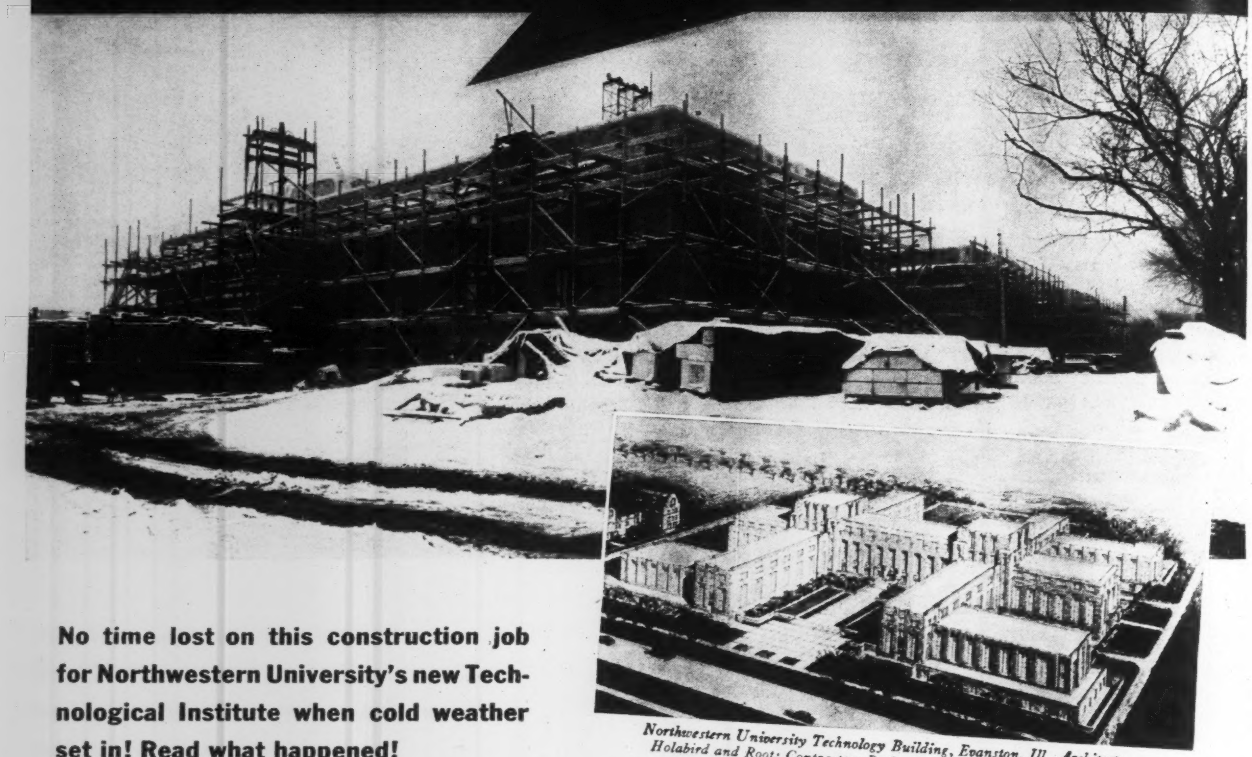
Engineering News-Record *reports projects of the following minimum costs:—waterworks, excavation, drainage and irrigation,* **$15,000;** ***other public works,* $25,000;** *industrial buildings,* **$40,000;** *other buildings,* **$150,000**

Four Weeks—Thousands of Dollars (000 Omitted)

Public Works	New England	Middle Atlantic	South	Middle West	West of Mississippi	Far West	United States Sept. 1941	United States Nine Months 1941	United States Nine Months 1940	Canada
Waterworks	312	910	595	394	463	2,674	**5,348**	**60,647**	56,537	225
Sewerage	....	1,925	688	882	491	362	**4,348**	**68,603**	68,673	270
Bridges, public	1,130	1,747	653	1,804	2,075	570	**7,979**	**87,069**	83,272	25
Earthwork and Waterways	153	1,412	2,651	662	2,209	1,588	**8,675**	**212,636**	196,733	314
Streets and roads	2,501	8,049	8,424	5,873	15,638	3,642	**44,127**	**471,761**	531,274	225
Buildings, public	5,905	23,069	57,474	17,115	150,038	58,570	**312,171**	**2,306,503**	541,984	8,318
Unclassified, public	6,575	4,685	26,104	1,927	6,652	12,464	**58,407**	**669,721**	292,999	6,328
Total public	**16,576**	**41,797**	**96,589**	**28,657**	**177,566**	**79,870**	**441,055**	**3,876,940**	**1,771,472**	**15,705**
Federal government (included in above classifications)	12,835	23,619	84,481	15,068	156,620	70,546	363,169	2,911,089	705,140	....
Private										
Bridges, private	100	225	....	....	....	37	**362**	**5,722**	10,578	....
Buildings, industrial	1,563	7,378	1,210	16,347	3,570	14,320	**44,388**	**400,162**	337,593	6,363
Buildings, commercial	1,890	9,127	475	2,075	5,223	3,485	**22,275**	**395,867**	278,240	....
Unclassified, private	153	564	877	1,549	1,698	1,330	**6,171**	**165,187**	105,090	1,663
Total private	**3,706**	**17,294**	**2,562**	**19,971**	**10,491**	**19,172**	**73,196**	**966,938**	**731,501**	**8,026**
Total Engineering Construction:										
September, 1941 (4 weeks)	**20,282**	**59,091**	**99,151**	**48,628**	**188,057**	**99,042**	**514,251**	....	....	**23,731**
August, 1941 (4 weeks)	45,402	77,395	116,137	64,211	177,674	48,742	**529,561**	....	....	20,058
September, 1940 (4 weeks)	25,171	72,184	84,793	89,724	62,706	31,674	368,252	....	....	47,012
Nine Months — 1941	**251,907**	**945,943**	**1,089,141**	**724,829**	**1,168,547**	**663,511**	....	**4,843,878**	....	**199,057**
Nine Months — 1940	164,203	578,096	556,446	469,398	439,028	295,802	....	....	2,502,973	204,764

SUMMER SCHEDULES —ALL WINTER LONG

because ***ATLAS HIGH-EARLY*** *was on the job!*



No time lost on this construction job for Northwestern University's new Technological Institute when cold weather set in! Read what happened!

Northwestern University Technology Building, Evanston, Ill. Architects: Holabird and Root; Contractor: R. C. Wieboldt Co.—both of Chicago.

THE CONTRACTOR started work on this building in the summer, using Universal portland cement. But when winter arrived—with its freezing temperatures—he switched to Atlas High-Early cement.

RESULT? Cylinder tests were made each day Atlas High-Early concrete was placed. Strengths obtained permitted early removal of forms, which enabled the contractor to maintain the same construction schedule during the cold winter months as during the warm summer months.

You too will find that Atlas High-Early Cement will help speed up your jobs and help you save time and money. For this cement gains working strength rapidly. It cuts time and costs required for protection and curing as much as 60% to 70%. It often permits earlier stripping and therefore earlier re-use of forms, thus reducing form costs. And it produces serviceable concrete in much less than usual time. Universal Atlas Cement Company (United States Steel Corporation Subsidiary), Chrysler Building, New York City.

OFFICES: *New York, Chicago, Philadelphia, Boston, Albany, Pittsburgh, Cleveland, Minneapolis, Duluth, St. Louis, Kansas City, Des Moines, Birmingham, Waco.*

NB-H-33

ATLAS HIGH-EARLY CEMENT

A UNIVERSAL ATLAS PRODUCT

ENGINEERING NEWS-RECORD • OCTOBER 9, 1941

Road officials turn attention to post-war highway planning

American Association of State Highway Officials prepares for quick expansion of highway work to take up slack in employment when defense activities decline.

Planning for the part that highway builders may play in the post-war readjustment and problems peculiar to the current defense program received active attention at the 27th annual meeting of the American Association of State Highway Officials held in Detroit, Sept. 29-Oct. 2. All but Idaho, Montana and New Jersey were represented at the roll call of states held at the opening session. Registration totaled nearly 900 before the convention closed.

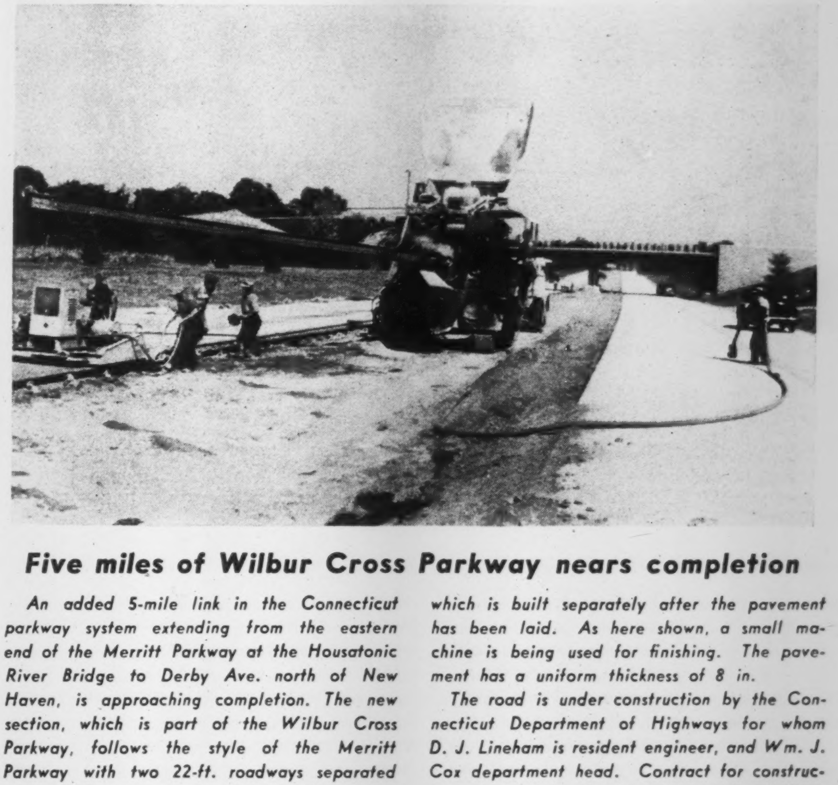
The urgency of looking beyond present problems was first brought to the attention of the association by its president, J. S. Williamson of South Carolina, in his opening address. Mr. Williamson stated that regardless of what happens there is bound to be intensification of road-building activities after the present emergency. A post-war boom, he said, "will mean more roads and better roads for increased demands of traffic. Should a depression follow, there will be of necessity a huge public-works program to take care of the unemployment problem, and highway construction will be a large part of the program." John M. Carmody, head of the Federal Works Agency, in a message delivered to the convention by H. S. Fairbank of the Public Roads Administration, not only emphasized the need for complete plans for post-war highway construction, but also pointed to the responsibility resting on highway officials to educate the public as to the soundness of their highway projects, some of which, such as city access roads, will be very costly. Robert B. Brooks, member of the Missouri State Highway Commission, touched on the same subject in his discussion of programming, pointing to the possibility of using post-war planning as a means for holding together the engineering staffs of state highway departments that may now be marking time due to a shortage of essential construction materials. Finally, at the banquet tendered to the A.A.S.H.O. by the Automobile Manufacturers Association, Governor Murray D. Van Wagoner, former member of the A.A.S.H.O., and Paul G. Hoffman, president of the Studebaker Corp., both turned attention to the same subject. Mr. Hoffman laid great stress on the importance of having plans ready for quick letting of contracts as being the only safe way to avoid having the post-war highway work converted into a vast WPA program.

An abnormal year

Events that have made the year 1941 an abnormal one for state highway departments were reviewed by President Williamson in opening the meeting. Of special note, he said, is establishment by the War Department of the Highway Advisory Committee, on which the A.A.S.H.O. is represented by Thomas H. MacDonald, head of the Public Roads Administration, and Mr. Williamson, Mr. MacDonald being chairman of the committee.

Mr. Williamson reported that on Aug. 27 the executive committee of the association had gone on record as favoring the apportionment of federal-aid funds

(*Continued on page 58*)



Five miles of Wilbur Cross Parkway nears completion

An added 5-mile link in the Connecticut parkway system extending from the eastern end of the Merritt Parkway at the Housatonic River Bridge to Derby Ave. north of New Haven, is approaching completion. The new section, which is part of the Wilbur Cross Parkway, follows the style of the Merritt Parkway with two 22-ft. roadways separated by a 20-ft. median zone. Between the median zone and the roadway is a concrete gutter which is built separately after the pavement has been laid. As here shown, a small machine is being used for finishing. The pavement has a uniform thickness of 8 in.

The road is under construction by the Connecticut Department of Highways for whom D. J. Lineham is resident engineer, and Wm. J. Cox department head. Contract for construction is held by the New Haven Road Construction Co., Inc.

OPM construction branch is being reorganized

Old duties of clearing Army and Navy jobs and giving priority ratings are expanded.

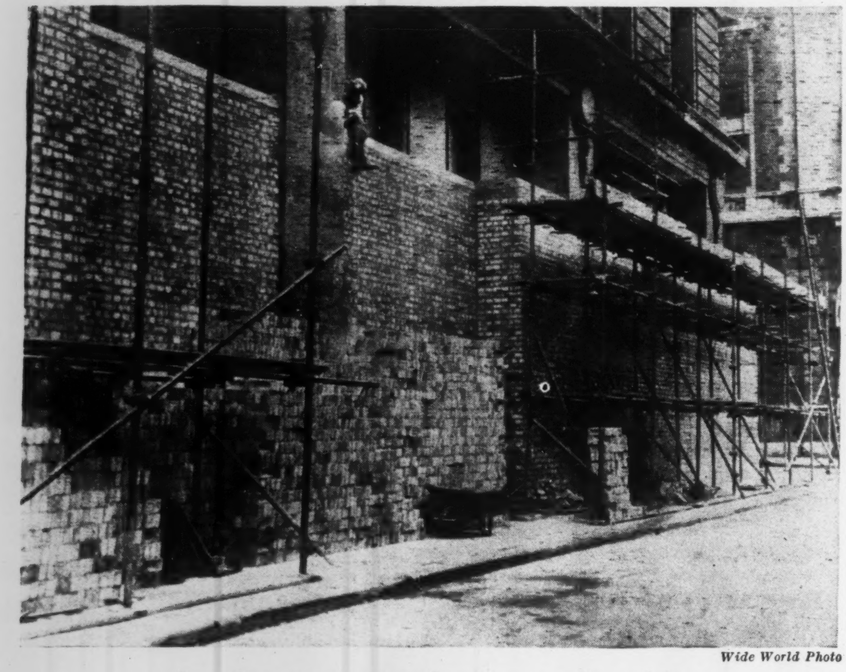
The Construction Industry Branch of OPM is going through a reorganization of its functions to bring it into line with the new OPM set up of industrial sections. It is losing some jobs having to do with the supply of construction materials and equipment and is taking on a larger voice in priority matters.

The construction branch is one of the smallest of OPM's 28 industrial branches, consisting of four men headed by W. V. Kahler formerly with the Illinois Telephone Co. Mr. Kahler was assistant head of the construction section under W. H. Harrison, until Mr. Harrison moved up last month to chief of the production division.

The branch has a trouble-shooting function plus two definite duties. One of these is to clear Army and Navy construction contracts. Under an executive order of last year, all defense contracts of more than $50,000 must be cleared by OPM. This duty is exercised by the purchases division of OPM, but that division refers construction contracts to Mr. Kahler's group for decision as to the suitability of the chosen contractor.

A newer duty, and one on which procedures have not yet stabilized, is to pass on applications for project ratings for defense construction and for defense and non-defense industrial plant expansion. Final decision on these ratings rests with the Project Rating Section of the Priority Division, under Ward Freeman, but Mr. Freeman has started to clear applications through Mr. Kahler. Just what phases of the decisions on applications are to be made by the construction branch is not yet clear. Presumably the branch will pass on such technical questions as whether the applicant is making the minimum possible use of scarce materials. Priority specialist in Mr. Kahler's group is W. C. Wetherill.

Beyond these two definite duties, the branch coordinates activities on new projects and provides a general service function in clearing up troubles arising on projects already underway. Thus, if one of the industrial sections dealing with some raw material decides that a new processing plant is required to increase the plant's supply, Mr. Kahler's job would be to organize the activities of RFC, Priorities Division, and any other agencies involved.



Wide World Photo

London prepares for more air raids

Although almost entirely free of such attacks during the past two months, the city of London is now intensifying its work for protection against more air raids in anticipation of bombing during the coming winter. Throughout the capital many blast and debris screens, such as that above, which will shield an office building to second-floor level, are under construction to protect offices and shops. Windows are being entirely blocked out on the ground floor of many structures. Many surface shelters are also under construction.

Two bids were received at the Sept. 8 opening with the $5,247,555 low bid received from the combined firms of W. E. Callahan Construction Co., Gunther & Shirley Co., Peter Kiewit Sons' Co., George W. Condon Co., Los Angeles, Calif. The combination of Porter De-Witt Construction Co., United Construction Co., Winona, Minn., was the second bidder with a bid of $5,493,062. The two firms bidding apparently considered it necessary to include large contingency items because of the duration of the job, 1,100 days being allowed for completion. The supply of labor and material shortages were also given as reasons for high bids, particularly the latter.

The Bureau of Reclamation has had no trouble getting reasonable bids on jobs with priority ratings. Granby Dam, however, will not get a rating because it has no power features.

• • •

Trade restraint found on electrical contracts

An injunction to end the monopolistic control of Local 3, International Brotherhood of Electrical Workers, AFL, over electrical work on building jobs in New York City should be issued, according to the findings of John Kirkland Clark, a special master appointed by the U. S. Federal District Court at New York about four years ago. Mr. Clark in his brief declared that a conspiracy between the union and local electrical contractors and manufacturers had added millions to the cost of public and private work within the city. He said that some products unacceptable to the union had been excluded from use in the city entirely, and that under pressure from the union other products assembled in factories, such as electrical control panels, had been disassembled on the job and reassembled by members of the union.

The action in which the special master made his findings was instituted by a group of manufacturers headed by the General Electric, Westinghouse and Allis-Chalmers companies. Parties to the injunction suit are given 20 days in which to submit their rejoinders to the district court before it acts on the special master's findings. The union may carry the matter to the Supreme Court.

• • •

Granby Dam bids rejected as being too high

Both bids received Sept. 8 for construction of Granby Dam across the Colorado River near Granby, Colo., have been rejected by the Bureau of Reclamation because they greatly exceeded the engineers' estimate. New bids are to be opened Oct. 20 and the job will be split in two parts.

Delay in awarding FWA housing job causes labor stabilization showdown

Low bidder on Wayne, Mich., defense housing units, who has CIO labor agreement, fails to get award, which is held up by OPM's labor division. Result may be showdown on labor agreement for the field of defense construction.

CIO's Construction Workers Organizing Committee is more or less deliberately forcing a showdown on the Construction Labor Stabilization Agreement negotiated by Sidney Hillman two months ago between the government and the AFL Building Trades Department (*ENR*, July 31, 1941, p. 29). That agreement in effect guaranteed that defense construction would be done by AFL labor, thus freezing out the CIO. This AFL monopoly is not written out in so many words in the agreement; but CIO is not a signatory to the agreement, and Section 6 provides that all contract defense construction "shall be governed by this labor policy." Since labor makes various concessions in the agreement—on overtime pay, multiple shifts, and predetermination of wages—it can readily be argued that only a signatory to the agreement is "governed" by it. It is known that this was the understanding among the negotiators when the agreement was signed.

This procedure is in accord with Hillman's stated policy of dealing, in each industry, with the dominant union in the field.

A test case

CIO has been bitter over its exclusion from defense work and has finally found a clearcut issue to make a fight on. Last month CWOC signed a closed-shop contract with the Currier Lumber Co. of Detroit (*ENR*, Sept. 25, p. 45), which immediately afterwards bid on a Federal Works Agency project for construction of 300 prefabricated housing units in Wayne, Mich. According to P. J. Currier, president of the company, his bid of $979,000 was low by $431,000. He was told, he says, to start work and that a contract would be forthcoming. Later, however, he was advised that clearance for the contract had been refused by Hillman's labor division of OPM on the ground that it conflicted with the stabilization agreement. It is understood the Michigan AFL unions had asserted award to Currier would violate the agreement and had threatened a general strike. Currier's version of the facts is not denied by Hillman's office or FWA. Spokesmen for the Federal Works Agency say that no final decision has yet been reached as to whether to award Currier the contract.

Federal Works Agency gives somewhat different figures on the bids received for the Wayne project than does Currier. The FWA figures show an even wider spread in the bids—$1,155,000 for Currier as against $1,678,000 as the next lowest; a third bid was $1,789,000.

Meanwhile, the stabilization agreement came under attack from another direction when an independent union of telephone workers protested against the clause in the agreement requiring subcontracting of specialty work. This, they said, would mean that on defense projects telephone wiring ordinarily done by telephone company employees would be handled instead by AFL electricians.

It is impossible to tell at this point what the fate of the stabilization agreement will be. It is hard to envisage any workable compromise, since AFL supremacy is an intrinsic part of the plan. In fact, the recognition of a single dominant union in each field is an essential phase of Hillman's program of wartime labor controls through industry-wide stabilization pacts. It is understood that the administration has exerted pressure on Currier to withdraw his bid and thus smooth over the present embarrassment, but so far he is standing firm on his proposal.

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Philadelphia sewer plan again declared invalid

The Pennsylvania State Supreme Court recently handed down a brief order affirming a common pleas court ruling that the city of Philadelphia's proposed $42,000,000 sewage disposal program was invalid. The plan imposed a charge of 30 cents per $100 of real estate assessment plus 25 percent of the annual water rent on that particular property. For added details of the plan and a similar proposal that was declared unconstitutional Oct. 7, 1940, see *ENR*, Sept. 11, 1941, p. 340.

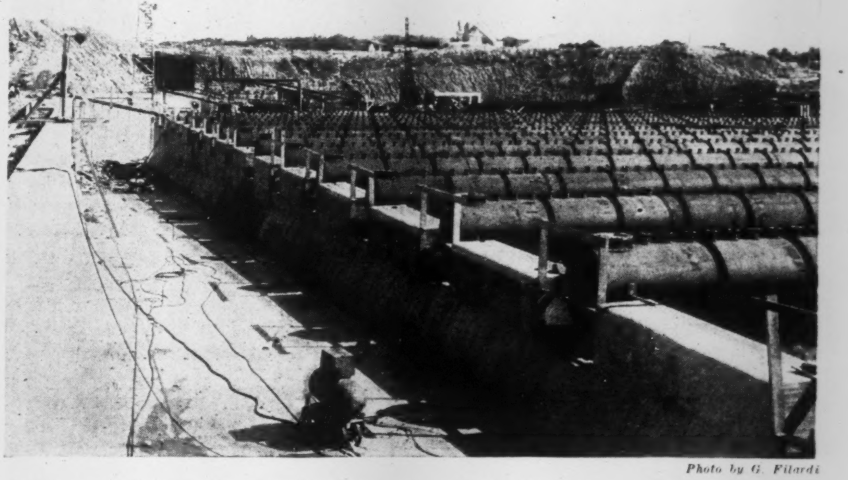

Photo by G. Filardi

Aerator to make Delaware Aqueduct more palatable

To treat New York City's Delaware Aqueduct water supply as it leaves the Kensico reservoir an aerator of 1,200 mgd. capacity and covering 2¾ acres is under construction. Aeration will increase the water's oxygen content when low, reduce carbon dioxide, and remove odors, and hydrogen sulfide and other objectionable gases, besides destroying certain micro-organisms. This will be accomplished by means of 3,492 nozzles of the type shown on the welded steel pipes above, which vary in diameter from 5⅓ ft. at the supply (far) ends to 4⅓ ft. at the dead ends near the reader. Interior of the steel pipes will be covered by a 2-in. coating of cement mortar for protection against corrosion.

The large pipes are resting on concrete saddles. Later they will be enclosed by concrete envelopes which will be finished flush with the tops of bronze nozzle bases. During the curing and pouring of the envelopes the nozzle bases are closed with blind flanges and the piping filled with water at about 10 psi. Between the envelopes the floor of the aerator will be paved with a concrete slab on a gravel bed.

For further details about the aerator see ENR Dec. 19, 1940, p. 822.

Permit sought for building new Tacoma Bridge

Colonel B. C. Dunn, district engineer for the U. S. Army Engineers at Seattle, Wash., last week announced that the Washington state department of highways has made application for the Washington toll bridge authority to reconstruct the Tacoma Narrows suspension bridge. Any protests from the standpoint of navigation must be received by Oct. 10, Col. Dunn stated.

The new structure will be a suspension bridge providing a 4-lane roadway and two sidewalks. It will reduce the vertical clearance as compared to the structure that collapsed, while horizontal clearances, including a 2,800-ft. main span, would be the same, according to figures released by Col. Dunn. At the center, the new bridge will be 179.2 ft. above mean higher high water, as compared to 198.2 ft. for the old structure; for the central 500 ft., 173.2 ft. as compared to 197.5 ft.; and on the channel side of the piers, 158.9 ft., which was 181.2 ft. with the older bridge. The piers would be higher or 497.7 ft. tall as compared to 443.1 ft. with the crossing that collapsed.

Meanwhile, the bridge authority announced it had retained Glenn B. Woodruff of Berkeley, Calif., and Leif John Sverdrup of St. Louis, Mo., to pass on the design of the new span.

The authority at a meeting Oct. 1 decided to use the $4,000,000 received from companies holding the insurance policy on the old bridge to retire $3,750,000 worth of bonds outstanding against the old structure, rather than use the money to finance a new bridge. The state thus saves $10,000 a month in interest but will have to pay a penalty, reported to be around $100,000, for recalling the 20-year bonds before they are due.

The authority did not decide how it would finance a new crossing but indicated it would investigate the availability of federal defense funds to meet part of the cost. A new bond issue may be floated to provide the state's share of the money.

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Canadian airports now ready for U. S. use

J. A. Wilson, director of air services in the federal Canadian department of transport, has announced that the chain of seven airports being built in northwest Canada to provide landing fields for air service between the United States and the Alaskan territory is ready for use, although not yet quite finished. Cost of the seven fields is estimated at $5,000,000.

JOBS OF THE WEEK

RESIDENCES, Bellmawr, N. J.

Paretta Contracting Co., Long Island City, N. Y., has been awarded a $2,023,000 contract for constructing 175 one- and two-story, frame homes by the Mutual Ownership Defense Housing Div., Federal Works Agency, Washington, D. C. Mayer & Whittlesey, New York, N. Y., are architects for the projeot.

FLYING SCHOOL, Pottsboro, Pa.

R. F. Ball Construction Co., Fort Worth, and Central Contracting Co., Dallas, got a $1,375,000 contract for expanding a basic Air Corps flying school. The U. S. Engineers, Denison, Tex., are doing the work.

HANGARS, Bagotville, Que.

L. G. Ogilvie & Co., Montreal, Que., will construct four double landplane hangars, and 25 miscellaneous and temporary buildings for an air operational school for the Department of National Defense, Ottawa, Ont. Estimated cost of the work is $1,000,000.

PIER AND BULKHEAD, Boston, Mass.

Bureau of Yards and Docks, Navy Department, Washington, D. C., awarded the contract for constructing a pile and timber pier and bulkhead to Roy B. Rendle & Co., East Boston. This work is estimated to cost $1,000,000. The contract for a concrete fitting-out dock went to J. G. Fitzgerald Construction Co., Boston. This part of the project is estimated to cost $3,000,000.

SUPERSTRUCTURE POWER PLANT, Green Bay, Wis.

C. R. Meyer & Sons Co., Oshkosh, Wis., will build the superstructure for a one-story, 82x172-ft. power plant for the Wisconsin Public Service Corp. The Public Utility Engineering & Service Corp., Chicago, Ill., is engineer for the project, which is estimated to cost $2,600,000.

NAVAL STATION IMPROVEMENTS, Oak Harbor, Wash.

The Austin Co., Cleveland, O., will build under a $3,540,000 contract the bulkheads, piers, four seaplane ramps, night lighting, seaplane parking area, seaplane hangars, barracks, messhall, and bakery for a Naval Air Station at Whidbey Island for Bureau of Yards & Docks, Navy Department, Washington, D. C. The contract was negotiated on cost-plus-fixed-fee basis.

NAVAL EQUIPMENT PRODUCTION PLANT, Erie, Pa.

United Engineers & Constructors, Inc., Philadelphia, Pa., will construct a 200x450-ft. addition to Building 13 to produce naval equipment for Maritime Commission. General Electric Co., Schenectady, N. Y., awarded the contract, and the Defense Plant Corp. will finance the work. It is estimated $1,471,000 will be spent for land and buildings and $5,293,000 for machinery and equipment.

BATTERY-BROOKLYN TUNNEL, New York, N. Y.

Mason & Hangar Co., Inc., New York, N. Y., will construct the Manhattan section of the Brooklyn-Battery Tunnel for New York City Tunnel Authority, New York, under terms of a $13,948,000 contract.

ENGINE FACTORY, Pottstown, Pa.

Ford, Bacon & Davis, Inc., New York, had been awarded supplemental contract for constructing an engine factory for the Jacobs Aircraft Engine Co., Pottstown. Construction is estimated to cost $3,000,000, while the cost for the entire plant is expected to be $13,000,000.

ROAD, Pennsylvania

Laub & Collins, Wilkinsburg, Pa., was low bidder for improving 12,355 ft. of highway and building two reinforced-concrete bridges in Indiana and Cambria Counties with a bid of $529,205, when the Pennsylvania State Highway Department, Harrisburg, opened bids Oct. 3.

AIRPORT, Saguenay, Que.

Local Construction Co., Ltd., Montreal, Que., will develop an airport site, including cleaning, stumping, grading, and paving runways and taxi strips for the Department of Transport, Ottawa, Ont. Estimated cost of the work is $540,000.

DEFENSE HOUSING, Biloxi, Miss.

R. P. Farnsworth & Co., Inc., New Orleans, La., will build 175 housing units at the Air Corps Technical School in Mississippi, for the Biloxi Housing Authority under terms of a $596,319 contract. Landry & Mattes, Hattiesburg, are architects.

AGGREGATE FOR PANAMA LOCKS, Panama Canal

Nevada Constructors, Inc., Las Vegas, Nev., has been awarded at $6,880,800 contract for furnishing 19,440,000 tons of concrete aggregate for the Third Locks Project for the Panama Canal Project. Nevada Constructors, Inc., is made up of the firms of J. C. Maguire & Co., American Concrete & Steel Pipe Co., Griffin, Gunther & Shirley, and Callahan.

NOTE—Additional bidding and contract news on over 800 projects large and small appear in the Construction News section beginning on page 139.

Plan 10,000,000-ton steel expansion

Expansion of the nation's steel-producing capacity to 99,000,000 tons per year was decided upon last week by the Supply, Priorities, and Allocation Board. This would be achieved by giving high priorities and government financing—to the tune of $1,250,000,000—to a 10,000,000-ton expansion of the steel industry. Present capacity of the industry is 86,144,000 tons of steel ingots per year, and privately financed expansions now under way will bring this to 89,000,000 tons.

At the request of OPM, submitted some months ago, steel companies have suggested expansion programs totalling 13,119,000 tons. From this list of projects, OPM has already approved and recommended for financing expansions with a capacity of 2,861,000 tons, and studies are now under way to select projects to complete the 10,000,000-ton expansion.

Nearly 2,000,000 tons of the new capacity, it is anticipated, will be located on the West Coast to make that area self-sufficient, so far as may be, in steel.

The proposed expansion is divided among 16 states as follows:

States	**Net Tons**
California	1,725,300
Oregon	60,000
Washington	80,000
Colorado	250,000
Texas	242,948
Alabama	300,000
Illinois (Excluding St. Louis area)	50,000
Indiana	1,153,200
Kentucky	144,240
Maryland	300,000
Michigan	428,800
Missouri (Plus St. Louis area)	578,400
New York	600,000
Ohio	1,925,200
Oklahoma	56,000
Pennsylvania	5,224,680
Total	13,118,768

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Engineers' Defense Board formed at New York

A new organization to be known as the Engineers' Defense Board has been created at New York City by seven national engineering societies to deal with technical problems on shortages, substitutions, conservation, raw materials, production and reclamation for a greater defense effort. Five representatives each have been appointed by the American Society of Civil Engineers, the American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, the Society of Automotive Engineers, and the American Institute of Chemical Engineers. The new organization, which will assist the various branches of government with engineering knowledge and experience on questions connected with military preparedness, will function as a clearing house for engineering information dealing with defense, particularly in relation to shortages.

Representatives appointed by the Am. Soc. C. E. are: Carlton S. Proctor, consulting engineer, executive committee representative; Richard E. Dougherty, vice president of Improvements and Developments, New York Central R. R.; Charles F. Goodrich, chief engineer, American Bridge Co.; Robert R. McMath, chairman of the board, Motors Metal Manufacturing Co.; and J. P. H. Perry, vice president, Turner Construction Co.

WASHINGTON HIGHLIGHTS

Defense construction already completed—about three billions worth—now exceeds all construction expenditures during the 1914–1918 World War, which totalled something under two billions. To date, a total of nearly seven billion dollars has been provided for defense construction through appropriations, authorizations, RFC commitments, and foreign orders. This consists of $4,181,000,000 for military posts, depots, fortifications, and the like, $602,000,000 for defense housing, $2,150,000,000 for construction of new industrial facilities.

The Quartermaster Corps has taken over from the Federal Works Agency the construction of some 250 recreation centers for soldiers to be operated by the United Service Organizations. Fifty-one locations had already been approved by FWA before the transfer as part of the Defense Public Works Program. Work is to start immediately on 25 of these. All details of the work on the U.S.O. buildings will be handled by the nine Zone Constructing Quartermasters rather than through Washington.

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Illinois buys ferry

The state of Illinois has acquired the ferry across the Illinois River at Kampsville, and on Oct. 1 started operating it as a free service to the public. This is the first venture of the Illinois state department of public works in owning and operating such a service. The ferry, which is a connecting link between state routes 108 and 100 in Calhoun and Greene counties, was acquired under an Illinois statute which provides for state operation until such time as a bridge can be built.

Bascule span at the Soo collapses under locomotive

One leaf of the double-leaf bascule railway bridge over the navigation canal at Sault Ste. Marie, Mich., collapsed under a locomotive in the early morning of Oct. 7, dropping the locomotive into the canal. The engineman and the conductor were drowned. Traffic through the two larger locks of the canal, a major artery for the movement of ore and grain from ports on Lake Superior, was blocked by the accident. The bridge was built by the Canadian Pacific Ry. in 1914 and is owned by the Duluth, South Shore & Atlantic Ry., which connects with the C.P.R. at that point.

John E. Armstrong, chief engineer of the C.P.R., in answer to a telephone call on the day of the accident, stated that the cause of the collapse is unknown. A train of the D.S.S. & A. was moving over the bridge, the bridge having been closed and all signals being clear, indicating that the span was properly closed and locked. As the locomotive went out into the north leaf of the bascule that leaf collapsed dropping with the locomotive into the canal. The tender and cars behind stayed on the rails.

The south leaf was fouled by the falling truss and its outer end is three feet below its normal position.

The bridge is a single-track structure, the largest double-leaf bascule in the world, being 336 ft. C. to C. trunnions. It is of the trunnion bascule type, designed by the Strauss Bascule Bridge Co. and built by the Pennsylvania Steel Co. It was unique at the time of construction in that the two leaves were designed to act as a simple truss when in closed position, special locking devices being installed to transmit tension and compression in the chords. For the tension lock a slotted socket of cast steel on one span engages a cast steel T-head on the other span as the span closes, the leaf carrying the T-head reaching the closed position slightly in advance of the other leaf. The operating mechanism pushes both leaves into final position and sets up initial tension on the lock. The top chord connection is a simple hinged compression joint with a tapered tongue fitting into a groove. A hook lock, forming no part of the load transfer device, has to be engaged before the interlock can be completed and the signals cleared.

Clearing the canal is expected to take about four days, and until it is cleared deep-draft ore vessels cannot pass down the St. Marys River. Lighter draft vessels can use the old Poe lock on the American side or the Canadian lock. Most serious will be the interruption to rail traffic to Canada which cannot be resumed until the canal can be bridged by a temporary trestle when navigation closes late in November.

Road officials study post-war planning

(*Continued from page 53*)

for the strategic network on the basis of 75 percent federal and 25 percent state contributions. He also noted the organization on July 1 of the Association of Highway Officials of the Southeastern States, as a component part of the A.A.S.H.O., with W. Vance Baise, of North Carolina, as president.

Financial records of the state highway departments during the past year were summarized by W. C. Markham, executive secretary, in his annual report. State highway departments in 1940 received a total of $1,047,000,000, chiefly from motor vehicle fees and gas taxes, only $158,000,000 coming from the federal government. They spent $1,015,000,000, of which 51 percent went into construction, 21 percent into maintenance and the rest into bond interest, engineering, etc.

Defense activities

Progress on defense highway work was outlined by Mr. MacDonald. Up to the end of August, 6,105 miles of work on the strategic network and access roads had been programmed and approved. On the 78,000-mi. strategic network, 1,159 miles have been completed at a cost of nearly $29,000,000; 4,288 miles have been approved for construction at a cost in excess of $172,000,000, and an additional 1,517 miles have been programmed to cost $64,000,000. The total program as approved for the strategic network is 5,805 miles, estimated to cost $236,600,000. About 300 miles of access road projects have been approved and programmed at a total cost of $26,500,000, of which the federal share is 57.5 percent. Studies of 400 defense areas show that 220 military areas need 2,410 miles of access road at a cost of $138,000,000, 70 naval areas presently will require 340 miles of access roads at a cost of $67,000,000, and about 110 industrial areas should have 400 miles of roads estimated to cost $50,000,000.

Reviewing the defense highway situation broadly, Mr. MacDonald drew attention to the evidence produced in Europe of the urgent need for supplementary and alternate routes for civilian use, to free main roads for military use, and asked the state highway department for the fullest possible cooperation in planning for such routes. Mr. MacDonald expressed concern over the increased wear and tear that is resulting from more intensive use of highways under the defense program and stated that in many instances replacement rather than costly maintenance is indicated if adequate capacity is to be maintained. Right now, he said, replacement of weak links is more important than the building of new highways. He urged the highway departments to keep their feet on the ground in the present emergency by recognizing that highway traffic is essentially local and that expenditures should be to meet these local needs rather than for long-distance hauling.

Highway finance

The public utility method of approach to the financing of highways has some merit, said L. I. Hewes, chief of the Western Region, PRA, but misapplication of that concept has resulted in much confused public thinking. As evidence he noted two recent studies made by reputable agencies, one of which showed that motor transportation is not paying its way through gasoline and motor vehicle taxes while the other showed that it is paying its way. Mr. Hewes would apply the concept only to highways financed by bond issues. He finds no justification for its application to work financed out of current revenues.

H. G. Sours, Ohio director of highways, in a discussion of federal and state financing of highways, stated that the debt plan of financing highway improvements no longer is justified except in very special cases such as major bridges and some of the more costly city-access roads. Mr. Sours believes that the charging of tolls is justifiable under some circumstances.

As to the distribution of road funds, Mr. Sours stated that the present federal-aid system had worked well, but in view of the fact that defense activities have overloaded the strategic network in many places, he believes that federal government participation in the replacement of these roads should be on a higher basis than at present. The federal government, he said, should bear the entire cost of access roads. He also advocated a well planned program of post-war highway construction.

Improvement program

Robert B. Brooks, Missouri state highway commission, urged the highway engineers to "take stock of your present situation, see what is to be done now and do it, and at the same time plan what is to be done when this present emergency is over and how the job can be accomplished." The latter planning, he said, should include a trunk system

American Association of State Highway Officials holds largest meeting in Detroit

The largest group of highway engineers and commissioners yet assembled for a meeting of the American Association of State Highway Officials gathered in Detroit last week for the 27th annual meeting of that organization. Forty-five of the forty-eight states were represented in the group here shown. Standing in the center (at the left on the opposite page) are Thomas H. MacDonald, head of the Public Roads Administration, the Governor of Michigan, Murray D. VanWagoner, former head of the Michigan Highway Department, host to the convention, and J. S. Williamson of South Carolina, retiring president of the association. The new president, not elected when this picture was taken, is Don Kennedy, head of the Michigan Highway Department, third man from the extreme left in the front row.

Photo by Spencer & Wyckoff, Detroit

of highways to supply the major transportation needs of each state; a study of the place of limited-access high-speed roads in that system; arterial highways into, through and around metropolitan areas, with their necessary terminal facilities; secondary and local roads; bridges and grade separations; and finally, financing plans, including a study of toll roads. He urged that highway organizations not be allowed to deteriorate because of a lack of immediate national defense highway work due to a lack of federal legislation.

More extensive use of the highway planning survey data was urged by William F. Childs, Jr., of Maryland. These data, he said, are of value not only in planning future highway work but also should serve as the basis for a review and reconstruction of the highway tax legislation in each state and for a sound revision of methods of allocating funds and taxing various types of motor vehicles.

Load limitations

The controversial subject of load limits on highways came up for frequent discussion. C. B. McCullough, Oregon, pointed to the dangers inherent in the present tendency to relax vigilance during the present emergency in order to speed the movement of defense materials. Citing Oregon as an example, he showed how some parts of the state systems are being severely damaged by overloaded trucks hauling timber to the mills. On the subject of loads resulting from the movement of tanks and other heavy military equipment, Mr. McCullough observed that the principal places to look for overstress is in floor systems and in short-span bridges. With proper control as to spacing, tanks present no greater risk than heavy commercial vehicles.

Discussion of his paper brought out the view, later put into a resolution adopted by the association, that the state highway departments charged with the responsibility for maintaining their roads in passable condition should have the last say as to what load limits should be imposed. This view was supported by R. H. Baldock, Oregon, in his discussion of load limitations under defense conditions, but he expressed the view that arbitrary maintenance of ultra-conservative restrictions may interfere with our defense effort.

Access road planning

R. E. Toms, Public Roads Administration, urged that access roads to military camps and defense industries be designed to provide for expansion and that structures and surfacing be selected with an eye to the expected service of the roads. Timber structures, he said, could be used to advantage on roads that appear to have no usefulness after the present emergency. Mr. Toms recommended the use of maximum half-hourly peaks in fixing road capacity rather than hourly peaks on roads leading to war industries and naval bases, and he said that for army bases the Sunday peak load should serve as a guide. He recommended the use of 12 ft. lanes and urged provision of ample terminal and interchange facilities. Where interference will cut the traffic flow by 50 percent, grade separations are justified, although full cloverleaf intersections may not be necessary at many points.

The serious problem created by traffic to the Glenn L. Martin plant in Maryland was outlined by Ezra D. Whitman. That state has spent $2,000,000 on access roads to this and other plants and camps or about one-third of its entire construction budget.

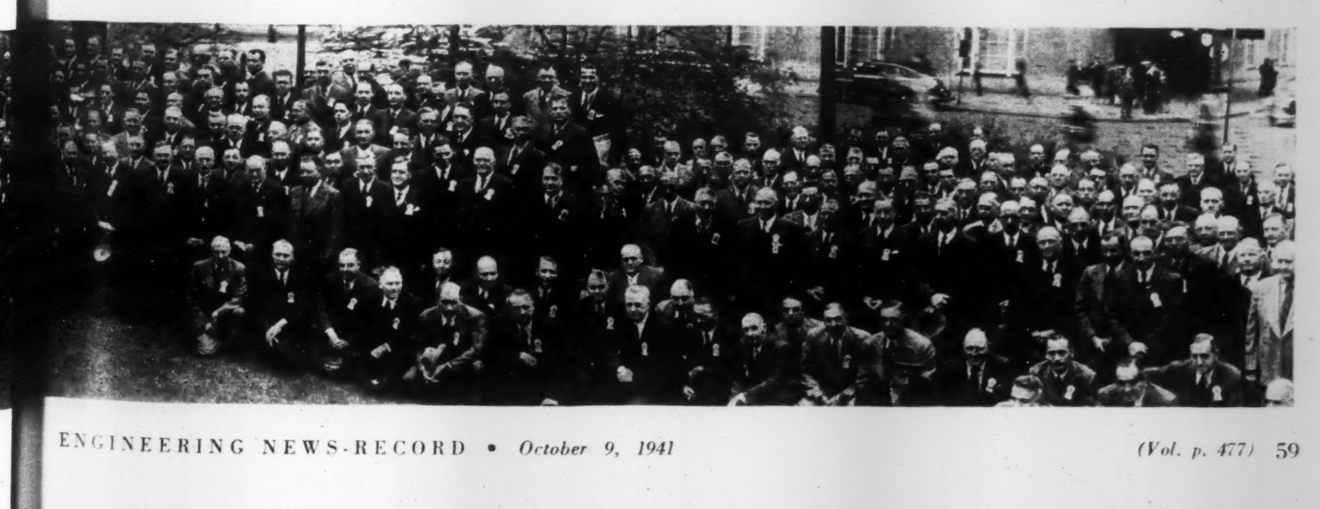
G. Donald Kennedy, Michigan, stated that, except for access roads, the defense needs in his state are almost wholly covered by the federal-aid system. Michigan's problem now is meeting the unbalanced traffic on its main highway system which has upset the highway department's plan by producing densities not anticipated until 1945. Because of priorities, the Michigan department has changed its concrete pavement from a 9:6:9 design to an 8-in. uniform thickness without reinforcing. Mr. Whitman, in discussion, stated that Maryland is considering similar action.

Through the adoption of formal resolutions, the association went on record as believing that many projected toll highways and toll bridges are uneconomical, and urged all agencies interested in such projects to cause a thorough study of their economics to be made so that unsound projects may not be undertaken. A proposal before Congress to provide $20,000,000 for further work on the Inter-American highway was endorsed. The association recommended to the Federal Works Administrator that street and highway projects be considered as a major means of providing employment in the post-war period and urged that state highway departments be employed to the fullest possible extent in developing plans for such work. Opposition was expressed to a tendency found in some quarters to take highway work out of the hands of the established state and federal highway agencies. The bill now before Congress to provide funds for defense highway needs was endorsed and Congress was urged to foster maintenance of the nation's highway system in a high state of efficiency by early authorization of adequate appropriation for federal aid for the next biennium.

Expressing the belief that a properly executed highway program is vital to the defense effort, the association recommended to Congress the immediate financing of necessary access roads by federal appropriations, an increase in the federal share of work on the strategic network, and provision of funds for surveys and plans for post-war highway work.

New officers

G. Donald Kennedy, state highway commissioner of Michigan, was elected president for the coming year, and the following were named vice presidents: T. C. Frame, chief engineer, Pennsylvania; Van T. Moon, chief engineer, Oklahoma; J. D. Adams, chairman of the Indiana highway commission; and C. F. Seifried, office engineer, Wyoming. George H. Henderson, Rhode Island, was re-elected treasurer.



OBITUARY

Henry J. Liebee, 49, state architect for the state of Iowa, died Oct. 1 at Des Moines. He was a graduate of the University of Pennsylvania.

Arthur J. Donnelly, 73, for more than 40 years an employee of the bureau of water at Philadelphia, died Sept. 29. Before his retirement in 1932, Mr. Donnelly had been supervisor of the sewer department and the bureau's high pressure system.

Joseph H. Rowell, 51, city engineer of Wakefield, Mich., died Sept. 22.

H. J. Gilbertson, 64, who headed a Memphis, Tenn. contracting firm bearing his name, died Sept. 30 in that city.

Luke Jackson Chandler, 58, for 25 years a member of the contracting firm of Chandler Brothers, Inc., of Virginia, died late in September at Virginia, Va.

George E. Barrows, 62, a partner in the firm of Ellsworth, Barrows & Pollard, valuation engineers of Buffalo, N. Y., died recently after a long illness. Before joining the valuation firm in 1910 Mr. Barrows was a civil engineer employed for several years by the Lackawanna R. R.

C. Manley Wade, Jr., 26, office engineer in the construction division of the du Pont staff building a large nylon plant at Martinsville, Va., was killed Oct. 5 in an airplane crash.

William I. Bishop, 66, Montreal, Que., construction engineer and a member of the Montreal Tramways Commission, died Oct. 2 at Joliette, Que. In 1919 he became managing director of the Raymond Concrete Pile Co. in Montreal and the following year founded his own company with the name of William I. Bishop, Ltd.

William G. Jones, civil engineer of Petersburg, Va. employed on the Santee-Cooper power project in South Carolina, died at Aiken, S. C. Sept. 30.

Burr H. Simpson, formerly state roads commissioner of West Virginia, died several weeks ago in that state.

Damage extensive on New Mexico highways

Eight federal highways in the state of New Mexico and four state routes were either closed or traffic on them delayed late last month during floods in the southern part of that state, the New Mexico highway department has announced. Governor Miles reports that so far in 1941 floods have caused a total of $8,000,000 of damage to New Mexico highways and that this year's floods have seriously hindered that state's construction program.

CONTRACTS AND CAPITAL

Engineering Construction awards for the week, $78,661,000, are 30 percent lower than a week ago, and 7 percent below the volume for the corresponding 1940 week. The sharp decline in federal work—54 percent under last week and 15 percent under last year—coupled with a lower volume of private construction, is responsible for the decrease.

Public construction, reflecting the decline in federal work, is 32 percent below the preceding week, but is 3 percent higher than a year ago due to the 32 percent gain in state and municipal construction. The state and municipal increase of 39 percent over a week ago fails to offset the decrease in federal work. Private construction is 18 percent lower than a week ago, and 37 percent below a year ago.

The current week's awards bring 1941 construction to $5,034,245,000, an 88 percent gain over the total for the 41-week period last year. Private awards are 27 percent above a year ago, and public construction is 113 percent higher as a result of the 285 percent increase in federal work.

CONTRACTS

(Thousands of dollars)

	Week Ending Oct. 10 1940	Oct. 2 1941	Oct. 9 1941
Federal	$39,043	$72,019	$32,980
State & Municipal	24,294	23,169	32,175
Total public...	$63,337	$95,188	$65,055
Total private..	21,460	16,518	13,606
TOTALS	$84,797	$111,706	$78,661

Cumulative
1941......(41 weeks)......$5,034,245
1940......(41 weeks)......$2,681,951

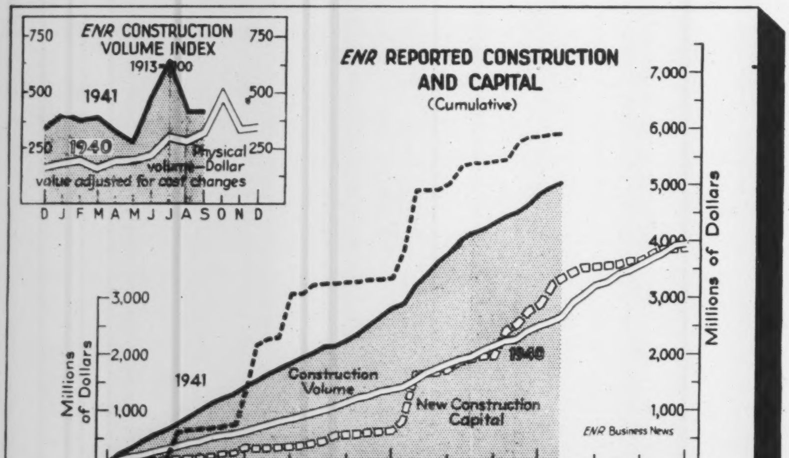
Note: Minimum size projects included are Waterworks and waterways projects, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

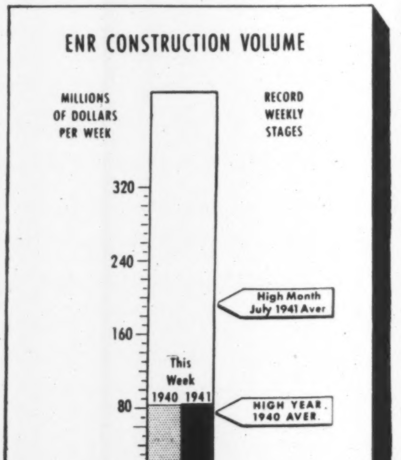
NEW PRODUCTIVE CAPITAL

	Cumulative 1940 41 weeks	1941 41 weeks
NON-FEDERAL	$1,199,289	$1,066,214
Corp. Securities....	207,394	317,398
State & Mun.......	391,758	360,581
U.S.H.A. loans.....	180,465	30,399
R.F.C. loans.......	195,672	94,336
R.E.A. loans.......	40,000	100,500
Federal Air—Hwy..	184,000	163,000
FEDERAL	$2,152,747	$4,826,118
TOTAL CAPITAL....	$3,352,036	$5,892,332

ENR INDEX NUMBERS

Index Base=100		1913	1926
Construction Cost...	Oct. '41..	264.46	127.13
Building Cost......	Oct. '41..	215.92	116.72
Volume	Sept. '41..	419	184





Comment and Discussion

Readers' opinions on matters that concern engineers and contractors

Welding Symbols

Sir: The article "How to Prepare Drawings for Structural Welding" (*ENR*, Aug. 28, 1941, p. 310) serves to clarify structural welding symbols and is a valuable step toward further standardization of these symbols. In this connection, it would be well to add a statement relative to the dimensions of welds; for example, a ⅜ in. fillet weld indicates that the legs of the weld are ⅜ in. long, giving a throat dimension 0.707 x the nominal (⅜ in.) dimension. Dimensions of welds have different interpretations in different shops, the writer has found.

The American Institute of Steel Construction has developed and tabulated a series of standard beam connections for riveted work which have such universal application that they form the basis for all riveted connections. It would be a contribution toward further standardizing welded structural detailing if that organization and the American Welding Society would develop a comparable set of standard beam connections. While this would in no way solve all the problems of welded connections, it would be of great value to designers, structural detailers and fabricating shops.

James D. Marshall
Consulting Engineer
Kansas City, Mo.

Old Pavement Costs Corrected

Sir: In my article reviewing the original portland cement concrete paving placed in Bellefontaine, Ohio, in 1891 (*ENR*, Aug. 28, 1941, p. 57), an error appears in the statement concerning the extent of this pavement. Your article indicates that the pavement comprises 7,500 sq.yd. whereas F. F. Wright, present city engineer of Bellefontaine, advises that this 50-year-old pavement has an area of only about 4,500 sq.yd. This difference in area makes an important change in the maintenance and annual cost figures appearing in the article, which I am correcting.

Total cost of all maintenance on this historic pavement, which has undergone general repairs only twice in 50 years, has been $1,100. Estimated cost to make necessary repairs to worn joints and the few base failures is less than $300. As stated by Mr. Inskeep, this would put the streets "in as good condition as they were the day they were opened to traffic." And these streets are good for many more years, even decades, yet to come.

Portland cement concrete pavement of the quality so successfully pioneered in Bellefontaine is the true low-cost road. Where else has five cents per square yard per year ever paid for both first cost and maintenance of an outstandingly first-class pavement—and even included allowance for complete repairs after 50 years of service?

Tracy Bartholomew
Pittsburgh, Pa.

Pipe Flow Pitfall

Sir: James A. Conklin, in his article "Flow in Pipe Networks by Direct Determination" (*ENR*, Sept. 11, 1941, p. 370) illustrates his method of calculation at the hand of a network that the writer sired in his modification of the Hardy Cross method (*ENR*, Mar. 3, 1938, p. 342). Since paternity imposes certain responsibilities for the continuing welfare of the offspring, the writer finds himself constrained to point out the pitfalls that inhere in Conklin's suggestions in spite of the fact that he obtains results that are close to those found by the Hardy Cross method as modified by Howland and Farr (*ENR*, Feb. 27, 1941, p. 330) or by the writer.

Conklin assumes that the flow is distributed between pipes in accordance with $d^{5/2}/l^{1/2}$ irrespective of what lies beyond any particular junction point. This is not so. A simple illustration will show how fallacious this assumption can be. If a network consists of a square in which water flows (1) in a clockwise direction through a 24-in. pipe that is followed by a 12-in. pipe, and (2) in a counterclockwise direction through a 12-in. pipe that is followed by a 24-in. pipe, it is obvious that the flow in both directions will be equal, the lengths of the pipes and their Chezy coefficients being the same. Application of Conklin's method, however, would assign $100 \times \frac{2^{5/2}}{2^{5/2}+1} = 85$ percent of the flow to the clockwise direction and $100 - 85 = 15$ percent to the counterclockwise direction. The error involved in this example would be 70 percent. Although Conklin states that his method is intended only as a preliminary basis for study, the danger of its use without adequate discrimination must be emphasized.

Gordon M. Fair
Professor of Sanitary Engineering
Graduate School of Engineering
Harvard University
Cambridge, Mass.

Bombs and Earthquakes

Sir: I was particularly interested in the article "Factors in Aerial Bombardment Protection" by Messrs. Harold E. Wessman and William E. Rose (*ENR*, Aug. 28, 1941, p. 300) in the discussion relating to the advisability of fastening outside wall panels of building securely to the frames supporting such buildings. Any efforts to design such walls as independent units, separated from the remainder of the building by planes of weakness, introduces a serious problem for the structural engineer who is charged with designing an earthquake-resistant building. By making such walls a rigid part of the building he has learned to take advantage of them as desirable elements for earthquake resistance and has, at the same time, largely eliminated them as fragment hazards when subjected to earthquake shock.

I am glad to note that the authors do not agree with the proposal of making these units more or less separate. I can share their views. A review of past records indicates that no place on this earth is immune from earth shocks. Recent developments indicate that we may now also assume that no place on this earth is immune from air attack.

Walter L. Huber
Consulting Engineer
San Francisco

EDITORIALS

VOLUME 127 NUMBER 15

October 9, 1941

Classified at Last

CONTRACTING has been called everything under the sun from a dignified business to highway robbery. Up to now, however, no single term has seemed adequate to describe the essential, exciting, uncertain business of contracting, where triumph or ruin may depend on the whim of a river or the weather. But at last we have it. An official War Department contract notice states: "Construction of recreation buildings, Camp Claiborne, La., $484,393—Tudor and Ratcliff, and Gravier and Harper (Co-Adventurers) Alexandria, La." That's it! Contracting is an adventure, and well-named at that.

Roadbuilders Look Ahead

NOTEWORTHY is the amount of attention given at last week's meeting of the American Association of State Highway Officials to the part to be played by highway building in the post-war adjustment period. There was a general agreement on the need for a large amount of advance planning if the abstract ideas of today are to be converted into actual surveys, blueprints and specifications ready for quick letting of contracts when the war emergency ends. Furthermore, because post-war road building may have to be on a vast scale, including costly city access and bypass roads, there also must be a campaign of public education to gain wide acceptance of the drastic steps that may have to be taken to get right-of-way if the start of work is not to be seriously delayed. Fortunately, the federal and state highway building agencies are well equipped to handle the first part of this program. They have the nation-wide highway planning surveys from which to draw sound conclusions as to what roads should be built, and they have trained engineering staffs to do the designing. Also, the emergency road bill now before Congress includes $10,000,000 for just such advance planning work. Lacking, however, is any considerable amount of money to purchase rights-of-way, and any plan to educate the public as to the need for quick action on what will be proposed by state highway departments. Those two needs probably can best be met through action by the federal government. Money for right-of-way purchase could be included in the emergency highway bill. Dramatization of the bold strokes with which the post-war highway building program must be drawn might well be undertaken by the President himself.

Current Highway Problems

DISCUSSION of post-war planning at the Detroit meeting of highway engineers did not eclipse consideration of current problems. Increases in highway traffic at most major industrial centers have produced traffic densities not anticipated until 1945 or 1946, which calls for greatly increased maintenance work if the efficiency of the overloaded facilities is not to be further reduced. Relaxation of load restrictions on defense trucking has further accelerated the disintegration of existing roads. Added complications are introduced by the slowing up of new construction projects, due chiefly to difficulties in getting steel for structures and reinforcing, and to a lesser extent to delays in getting repair parts for construction equipment. Granting of priority rating to maintenance needs and to steel for work on the strategic network is expected to help this situation, but some state highway departments are meeting the shortage of reinforcing steel by eliminating it from concrete paving, thickening the section somewhat, and by substituting timber or concrete for steel in culverts and small bridges. In short there is plenty of current work to do along with the necessary planning for the future.

Union Checked

NO ENGINEER, architect, public official or contractor in New York could possibly have been surprised last week when a Special Master reported to the U. S. District Court that AFL Electrical Workers Local No. 3 was guilty of boycotting electrical products made outside its jurisdiction. The only element of surprise was that it required twenty volumes of testimony to establish the fact. The nation heard about Local 3 when it tied up construction of the New York World's Fair until it was permitted to tear down and reassemble electrical products that had been built by companies that were not on its approved list. But its machinations have been common knowledge locally for years. Rockefeller Center felt its sting, so did the Wards Island sewage plant and the Triborough Bridge, to mention some widely known projects. But Local 3 was outside local law to such a degree that electrical contractors and electrical manufacturers in New York had to accede to its demands and join in the conspiracy. At least they did join it to their great discredit. Now the Special Master says the combination was in restraint of trade and violated the Sherman anti-trust laws. Any other conclusion would have sanctioned the setting up of totalitarian union empires in every city of the land to exact tribute from each and every citizen and to bar the use of all labor- and cost-saving devices that did not meet a union's approval. The lesson to be learned from this is not that unions as such are bad but that they can abuse power just like other organizations or individuals. It is to be hoped that the Supreme Court will recognize this fact by supporting the Special Master's conclusions if they are carried to that court for review.

Timber Proves Its Worth

CANADA HAS GIVEN the builders of this country a fine example of how to meet the structural steel shortage by the use of timber and of how to conserve transportation by wide employment of local materials. In planning a great structure for the manufacture of flying boats in British Columbia the designers specified treated timber for the frame and roof trusses and plywood and wood-framed sash for the exterior walls. Now that the structure is completed, it appears that little could have been gained by using steel even if no emergency had existed. With the double Warren roof truss design to avoid concentration of stresses at panel points and ring connectors to give full effectiveness to the joints, the required roof truss span is provided with an ample safety margin and at low cost. Chemical treatment of the timber gives new values in durability, and in the light of the full-scale fire test to which the building was accidentally subjected (see article in this issue) it appears that the fire hazard is much less than might be expected. Finally not only does the use of a material produced locally relieve transportation facilities but it permits ready repair of damage such as might be produced by aerial bombs or sabotage. This building and others in our own country emphasize that timber is not only a defense material of first rank, but that modern practices in its manufacture and use offer the designer what is in effect a new material for peacetime applications.

Fair and Workable Contract

EFFECTS of rising construction costs have passed the stage of abstract discussion and are today beginning to exert a damping influence on those types of work that involve normal economic considerations as distinct from defense requirements. Normal construction, including municipal, state highway and non-defense federal improvements, is the stabilizing influence in the industry, and even today provides work for many engineering organizations and contractors.

So far, this work has been carried on through the generally accepted procedure of proposals based on unit bids and award to the low bidder. Bidders, however, are forced to recognize the upward curve of cost trends, and even anticipate its possible steepening. The result is a proposal frequently out of line with the engineer's estimate, which is normally based on current costs. Contract awarding agencies observe this differential and have a negative reaction, not so much as to any actual rise in cost of the work, as to a belief that they are paying for heavy contingency allowances that the contractor may not have to meet. Already one state highway department has threatened to stop all new construction because of this condition. Both sides have defensible positions, and only by forthright compromise can a satisfactory solution be worked out.

A step in this direction has been taken by the City of Chicago on a subway contract, where the over-estimate bid was considered unacceptable. After weeks of study the city and the low bidder arrived at a formula designed for mutual protection. Briefly, it provides that the city will accept the bid, with a minor reduction in the lump-sum item, and that the prices on the unit items will be the ceiling that may be reached but cannot be exceeded since the contractor has already established them by a firm proposal. Below that figure any saving based on costs plus a 10-percent profit, determined by joint-accounting, will be divided equally.

Elements of a cost-plus contract are apparent in such an arrangement, with the original selection of the successful bidder, however, determined by open competition. Although its details may not be directly adaptable to every non-defense project, such an agreement is worth the attention of all contract-letting agencies. Some means must be found to keep essential non-defense construction going.

ENGINEERING NEWS-RECORD

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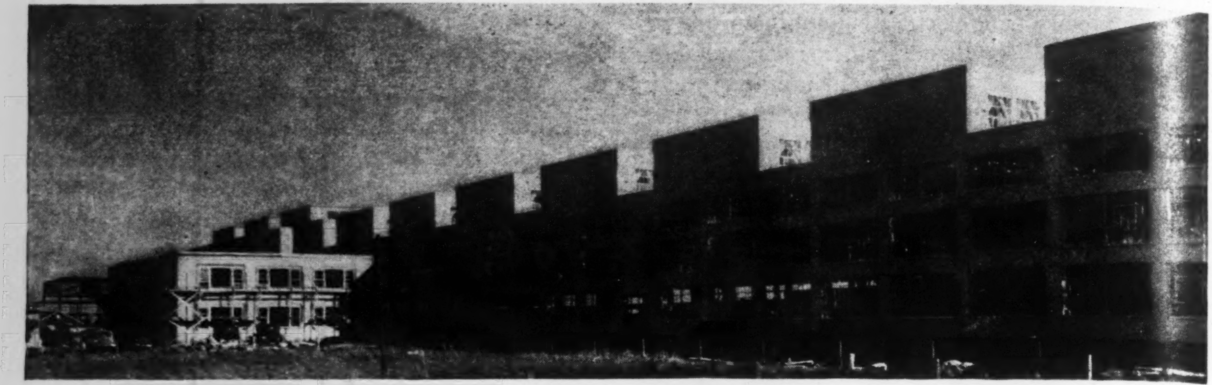


Fig. 1. Sheathed in plywood and framed in timber this Canadian aircraft plant used local materials and conserved steel.

An Airplane Plant Built of Timber

Contents in Brief—*Timber roof trusses save steel in 260x780-ft. Canadian plant for the manufacture of flying boats. Precutting timber including boring, grooving and dapping at the mill aids in speedy assembly of 128-ft. double Warren trusses which were put together with split ring connectors at the rate of five per 8-hr. shift. Plant utilizes 3,000,000 b.ft. of treated timber; exterior finish is plywood designed for weather exposure.*

A PLANT RECENTLY BUILT in British Columbia by the Boeing Aircraft Co. of Canada, Ltd., for constructing Consolidated PBY flying boats has used timber in trusses, columns and exterior finish. This made it possible to obtain materials close at hand at a considerable saving of steel needed for other wartime purposes. The airplane manufacturer indicated preference for timber as the construction material, specified clearances and overall dimensions and then entrusted development of details to a contractor who did the work on a cost-plus-fee basis. The result is a structure said to be highly satisfactory in fulfilling the building specifications in an efficient and economical manner.

The site is on low, level ground where the paving of a large area had to be laid on the surface of soft material with the water table only 2 to 6 ft. below. Merely spreading and rolling gravel was not effective because the mud persistently worked up through the successive gravel layers. The problem was solved by spreading a 6-in. layer of cinders on the ground surface before putting on the gravel. The mud seemed to form a binder with the cinders and the combination could be consolidated into a tight layer that served well as a base for 18 in. of gravel. After this much gravel had been rolled, in successive layers (12-ton roller) the finished surface was firm enough to support a motor truck and trailer with a 20 ton load, without leaving a permanent mark.

The paved area includes the 260x780-ft. main building, the 170x390-ft. overhaul building and the 350x390-ft. space between these two structures. Concrete surfacing was used for the floors of the two buildings and for the warming aprons, 100 ft. wide, at the ends of both buildings. The remaining central strip between the two buildings was paved with asphalt. Footings for the building columns were provided by driving 30 and 40-ft. cedar piles (which developed their bearing power through skin friction) capped by concrete piers.

The smaller building, designed under somewhat different conditions, is built of steel following more or less conventional lines. It opens out to the space between the two buildings with three 35x128-ft. doors. The main plant building, to which this description is primarily devoted, is an example of almost exclusive use of timber in a large industrial building. Even the window sash are wood although pivoted to swing as does steel sash. Perhaps most typical of advantages to be had in a timber producing country is the fact that in the ramp on which seaplanes will be brought up to the paved area between the two buildings, timbers of exceptional size and length simplified the design. This ramp, which required a total of 580,000 b.ft., has in it timbers 16x16-in. in section and 60 ft. long.

The main building

The main building, 260x780 ft. in plan, is so located as to leave space on either side for an addition of the same size if duplicate units are later needed. Separated by fire brick walls are a 75x170-ft. paint shop, a 40x230-ft. plating room and a 40x60-ft. planishing room. A power plant for heating the buildings and providing an independent source of power is located in a separate structure set just far enough away from the main building for a duplicate unit.

The floor of the main building is paved with 6 in. of concrete in which $\frac{3}{8}$-in. steel rods are spaced 14 in. both ways, about 2 in. above the subgrade. The 4.8-acre floor area in this building was finished by machine- and hand trowelling after dusting over the surface and working in a mixture of cement and metallic floor hard-

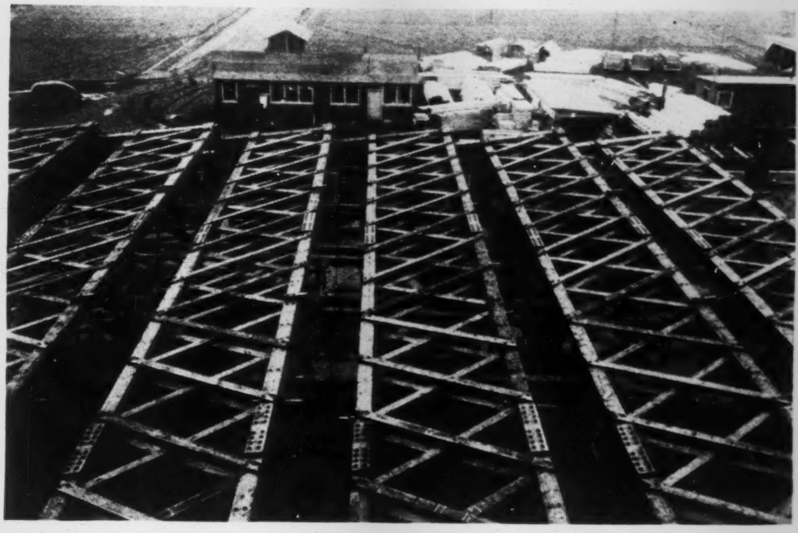


Fig. 2. The 128-ft. roof trusses and their supporting columns were assembled on trestles whose height difference inclined the columns enough to let them extend under the assembly next adjoining. Trusses were put together at the rate of five per 8-hr. shift. They were then raised into position as illustrated below.

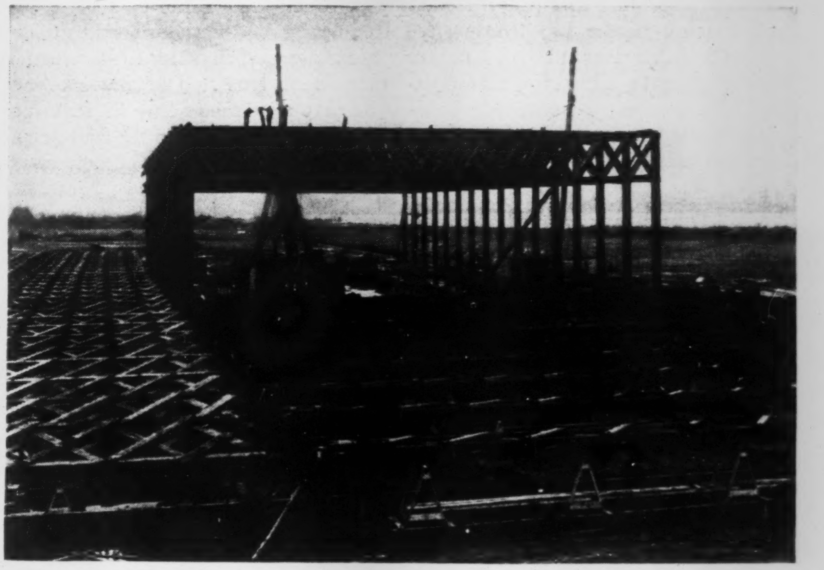


Fig. 3. Each truss and its attached columns was picked up as a unit and set in place by a pair of derricks. With booms lowered, derricks could move ahead under bottom chord of erected truss into position for lifting next truss.

ener. The result is an exceptionally smooth, hard surface. Utilities (water, compressed air and electricity) are carried in floor trenches in the concrete covered by 2¾x18-in. precast concrete slabs. Outlets from these troughs, under hinged metal covers, (offsets from the troughs themselves) are spaced at intervals (usually 10 ft.) suited to plant operations.

Doorways have a clear width of 126 ft. and a height clearance of 35 ft., the same as that of bottom chords of the roof trusses.

This building has a single row of columns down the centerline dividing the working space into two bays, each 128 ft. wide between column centers. As the roof trusses are 20 ft. apart, the columns down the building center also are 20 ft. apart except near the end of the plant where sub- and final assembly work is done. Here the column spacing on the center line is increased to 120 ft. for two bays (240 ft. back from the building end) by the use of heavy steel trusses. Even here, however, timber trusses of 120-ft. span are placed longitudinally in these two bays, framing into the transverse trusses of steel with the aid of flush type shear plate timber connectors. These shear plates, of malleable iron, 4 in. in diameter with a bolt hole through the center, are placed flush in the face of the timbers in pre-cut daps. Bolts running through a steel strap in contact with the timber and through the shear plate (and timber) form one end of the connection between the wood truss and the steel truss; the other end is the strap riveted to the steel truss. These plates are designed so that they will develop in bearing against the timber the full shearing strength of a ¾-in. bolt, when the load is applied parallel to the grain of the timber.

Throughout the major portions of the building length, the roof level is lowered by the depth of the roof trusses (13 ft.) every third bay to provide for windows, thus giving a dropped monitor type of roof lighting. In the assembly end, where the roof supports are trusses in both directions, depressing the roof level for purposes of lighting would have formed rectangular pockets in which snow could accumulate. To obviate any snow menace, the monitor sections were here raised instead of lowered. The roofing proper is a tar-and-gravel surfacing (15-year guarantee) on 2-in. tongue-and-groove sheathing.

Roof trusses

The timber roof trusses are of the double Warren type which, because of the multiplicity of web members, keep the joint stresses low enough so that they can be transmitted in most cases by a single bolt and a pair of split ring connectors. This design is expected to eliminate the effect of shrinkage on the strength of the truss. All the joints are made with split ring connectors. The timbers for the trusses were all pre-cut, including grooving for connector rings, boring the bolt holes and dapping, and were then treated by the chromated zinc chloride process before being shipped from the treating plant. Thus almost all cutting of treated lumber was eliminated when the trusses were finally being assembled.

The trusses and the supporting columns, which are an integral part of each truss, were assembled at the site on wooden trestles. These trestles were of two heights and were so spaced that each truss was put to-

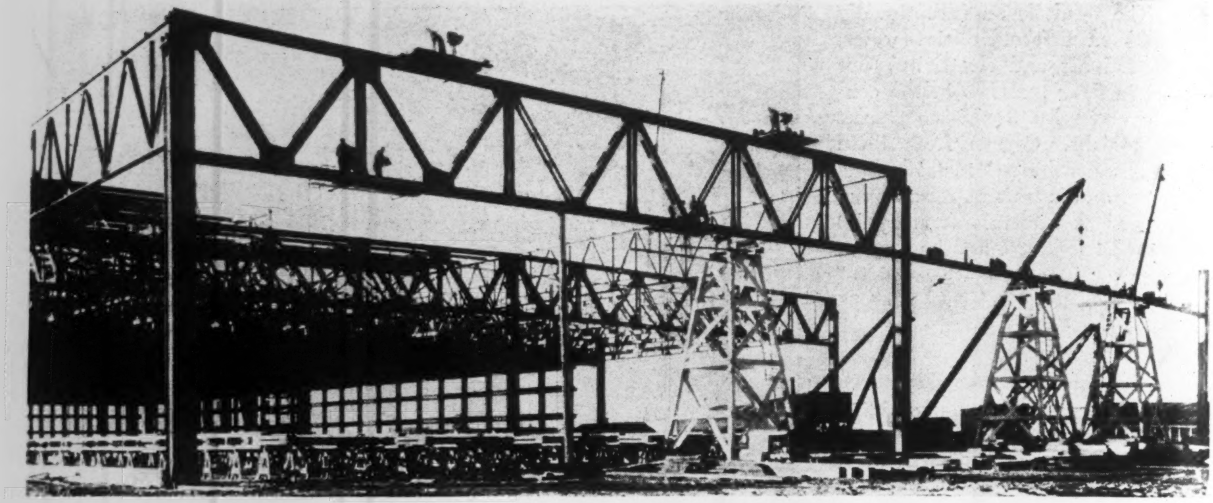


Fig. 4. For 240 ft. from one end of the plant (used for final assembly) steel trusses made it possible to do away with all but one central column. Even here, fill-in trusses (at right angles to the steel) were timber.

gether in an inclined plane, permitting the long columns to extend under the next adjoining assembly. Height and spacing of the two trestle sizes was such that a clear space of 1-ft. was left between to allow for manipulation of wrenches in tightening bolts.

On these trestles the pre-cut members were laid out and bolted up at a rapid rate. The crew foreman and helpers placed the first main timbers for top and bottom chords while other crew members were assigned to bringing in and placing diagonal timbers in the proper sequence and also to placing and tightening up bolts. The joints with ring connectors were given careful attention to make sure that the several members were drawn together and held in close contact until bolts were tightened. This was done with angle iron yokes and chains aided by light hydraulic jacks of 10-ton capacity. A yoke with a chain at each end was placed across the upper surface of the joint, the lower ends of the chain were caught in a second angle iron slotted at either end, and the jack was worked between this suspended angle and the lower face of the joint to force the connectors into firm contact. After being broken in, a crew of 15 carpenters and 20 laborers could regularly assemble five of these 128-ft. trusses in an 8-hr. shift. There were 59 trusses to be assembled, 27 in each of the two bays.

When the trusses were ready for erection, a pair of stiff leg derricks moved in and lifted them bodily to an upright position where they were braced temporarily. After each truss was set up in place, the 70-ft. booms of the derricks were lowered to pass under the bottom chord, and the derricks were then skidded forward to the next truss. The derrick mast heights were made only 32 ft. to permit free movements in the 35-ft. clearance under the bottom chord of trusses already in place. These derricks, with a crew of 11 men, made 4 to 6 truss set-ups and moves in an 8-hr. shift.

For exterior finish, wood was also selected in the form of 5-ply panels weather-proofed by the hot-press process. These came to the job in 8-ft. lengths and in four widths ranging from 32 to 48 in. These panels were put through a machine on the job to give a $\frac{3}{4}$-in. rabbett and hence an overlap on all four edges. In painting the plywood the first and second coats were brushed on using plastic fire-retarding paint. The final color coat, an olive green, was put on with spray guns.

A fire test

An exposure to fire hazard that occurred when the plant was nearly completed was a highly informative incident. Fire broke out in a two-story wooden office building only 30 ft. from the main plant building with the exterior plywood finish. This fire occurred before the permanent fire protection system for the plant had been installed and while it was dependent upon chemical fire protection and city service. By the time fire fighting apparatus could be brought to the plant, the main building had been exposed for 45 min. to a fiercely burning fire only 30 ft. away. When a fire hose was finally brought into play, the plywood sheathing had been burned away but the charring of the truss and column timbers was nowhere deeper than about $\frac{3}{8}$ in. A few of the diagonals in the roof trusses were replaced, but only relatively minor damage was done, and such airplane construction operations as had been already started in the plant were in no wise delayed as a result of the fire.

The fire gave considerable confidence in the ability of a structure of this type to resist fire. A very serious loss might have resulted if the structure had been inclined to burn readily. The treated timbers did not readily spread the conflagration, and it is felt that with a fire protection system ready for instant service and with men on each shift specially trained for directing fire fighting, the fire hazard will be relatively low. The plant now has its own fire pumps with hose and truck. The two-story office building that was completely destroyed is being rebuilt 90 ft. (instead of 30 ft.) away from the main building.

The plant has been constructed for the Boeing Aircraft Company of Canada, Ltd., Stanley Burke, president, by the Carter-Halls-Aldinger Co., Ltd., engineers and builders; J. E. Buerk, vice president, R. C. Pybus, engineer, D. Colville, architect, and G. W. Crockett, superintendent of construction.

Suspension Bridge Anchored in Clay

M. G. Dempster
Bridge Engineer, County Roads Board
Victoria, Australia

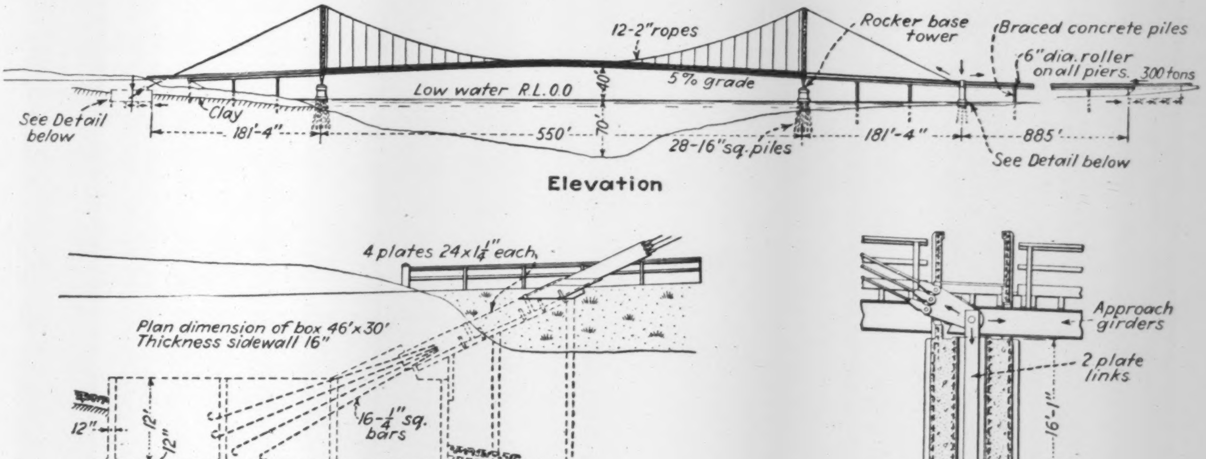
THE NEW SUSPENSION BRIDGE near Victoria, Australia, connecting the mainland with Phillip Island, a popular tourist resort, is of particular interest because its anchorages are founded on clay. Furthermore, to keep from building one of these anchorages in the water (where its normal position at the end of the backstays would have placed it), it is located at the far end of a 15-span, 885-ft.-long, girder approach; this anchorage takes the 300-ton horizontal component of the cable pull while the vertical component is taken by an anchor pier at the end of the backstay. The opposite anchorage could be located in the normal position, and is therefore designed for both vertical and horizontal forces.

A suspension-type bridge was chosen because the main channel, having a water depth up to 70 ft. and a 9-knot tide with a 12-ft. range, ruled out short-span construction, except for the approaches. Backstays are unloaded, and these side spans are carried on girders similar to the approaches. Total length of the bridge is about one-third of a mile. Two lanes (18 ft.) wide, it is designed for relatively light loads—8 tons per lane maximum vehicle load, and 125 lb. per lin. ft. uniform live load per lane, equivalent to 4,000-lb. cars at 32-ft. centers.

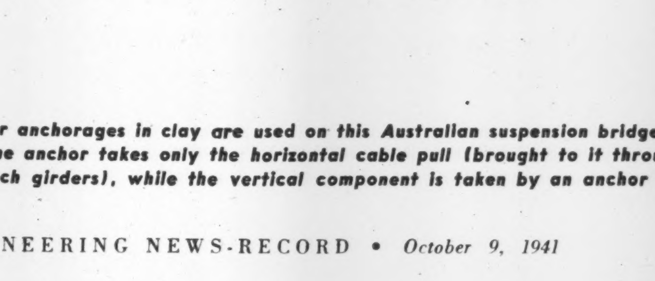
The principal design difficulty arose from the necessity for building anchorages in clay. The bearing and shear strength of the clay were measured in place by applying loads between boards within a trench and by shearing off undisturbed pillars of considerable size, which were tested in the laboratory. These tests indicated that the anchor should be of such form that shear stress on the clay would not exceed 400 lb. per sq.ft. and that bearing pressure should not exceed 2 tons per sq. ft. It was decided that the anchor should be of such dimensions that the 300 tons of horizontal pull could be distributed over an area of 1,700 sq. ft.

As shown in the accompanying illustration, a large cellular concrete box having a series of transverse walls cast into excavated trenches was provided. It was assumed that in addition to the floor area the clay would be under shear stress up to the natural surface and that an area sloping from the bottom of the walls at 1:2 to the natural surface would also be effective in taking the shear. It was appreciated that clay would yield gradually over many years but the absence of appreciable movement after five months indicates that the anchorage design adopted is going to prove satisfactory.

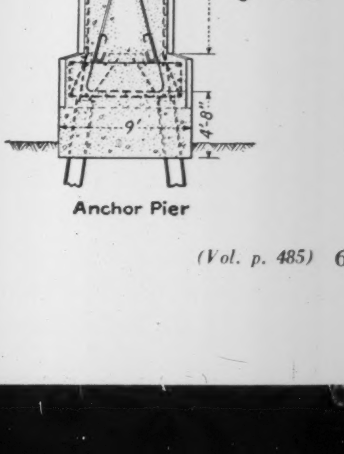
The bridge, which cost £50,000, was designed and constructed by direct labor under the author's direction.



Elevation



Anchorage



Anchor Pier

Cellular anchorages in clay are used on this Australian suspension bridge. Note that one anchor takes only the horizontal cable pull (brought to it through the approach girders), while the vertical component is taken by an anchor pier.

Deep Caisson for Panama Canal Built on the Ohio River

By M. M. Lachowski
Naval Architect, Dravo Corporation,
Pittsburgh, Pa.

***Contents in Brief**—A deep-draft caisson for closing lock entrances at the Panama Canal for repair work was built recently at Pittsburgh, floated on its side down the shallow waterway in the Ohio and Mississippi, and then righted at New Orleans for towing to Panama.*

AN UNUSUAL PIECE OF MARINE equipment, a floating caisson for the Panama Canal locks, was built recently at the Neville Island yard of the Dravo Corporation at Pittsburgh. Though that yard has special facilities for such construction, building the caisson so far inland on a relatively shallow waterway presented some difficult problems in getting the caisson to deep water in the Gulf of Mexico.

Design of the caisson

Designed by the Bureau of Yards and Docks of the Navy, the caisson is intended to be floated against a lock entrance to permit complete unwatering of the lock for servicing and repairing the gates and outer parts of the structure. It is 113 ft. long, 32 ft. wide and 65 ft. high, and when light has a draft of 32 ft. in salt water. When used to close off a lock, water ballast is added to give it a draft of 62½ ft.

As the light draft of the caisson in upright position would be far in excess of the 9-ft. channel depths in the Ohio and Mississippi rivers from Pittsburgh down to New Orleans it was decided to float the caisson on its side as far as New Orleans, but preliminary calculations showed that when lying on its side, with the pumps and motors installed but without permanent ballast, its draft would range from 14½ ft. at the keel end to 6 ft. at the deck end. As the draft at the keel end still was too deep for the Ohio waterway, the floating arrangement shown in Fig. 3 was adopted, the buoyancy of the two gasoline barges being used to reduce the draft of the keel end of the caisson.

Construction of the caisson

The caisson was built on its side on the marine ways in the Neville Island yard, as shown in Fig. 2. The structure is mostly of riveted construction, and extensive use was made of cold riveting because that is more economical for plates of considerable size and large size rivets. Some of the heavy members such as the keel, however, were fabricated and attached by welding. The fenders, built of curved steel plates, also were welded on the outside shell. All outside surfaces received a coat of bituminous enamel.

For its operation the caisson requires pumps for dewatering its ballast tank or the lock chamber that it is used to close off, motors, ventilating fans, deck cranes, anchor windlasses and capstans. The pumps and motors had to be installed on the ways during construction, but the deck equipment was not installed until the caisson reached New Orleans. The equipment is electrically driven, power being taken from the shore. All operating equipment was installed on a watertight main deck next to the upper deck.

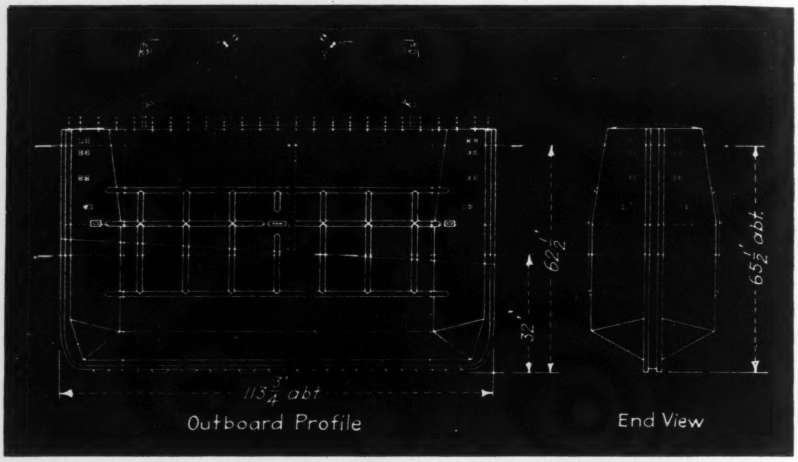


Fig. 1. Principal dimensions of the lock caisson. When floated in upright position it has a draft of 32 ft., too deep for the Ohio and Mississippi channels.

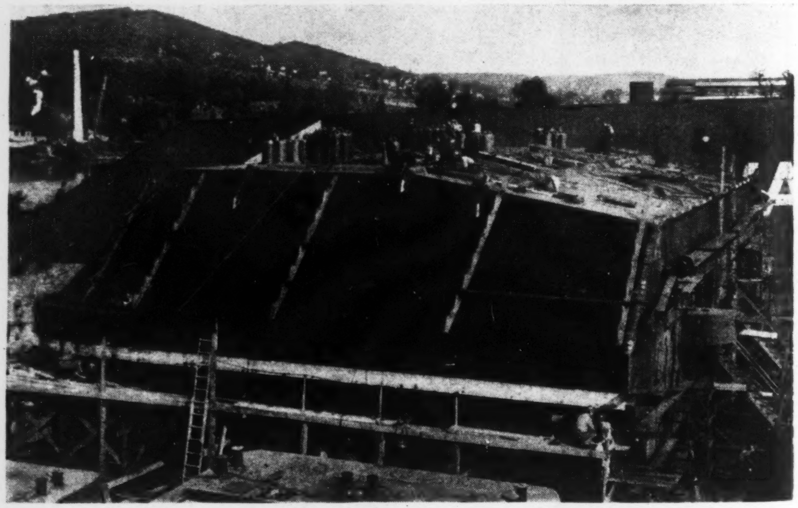


Fig. 2. The caisson was fabricated on its side on launching ways of the Neville Island yard of the Dravo Corp. at Pittsburgh, Pa.

No permanent ballast was added before launching, the ballast being added at New Orleans during the process of righting the caisson.

Movement to New Orleans

For towing to New Orleans the two gasoline barges shown in Fig. 3 were securely lashed to the caisson, and in addition three coal barges and two cargo barges were included in the tow to protect the caisson from possible damage. The 750 hp. twin-screw diesel towboat "Neville" of the Union Barge Line took the tow down to New Orleans. Double locking was necessary on the Ohio because of the size of the tow. The U. S. Engineer Department provided river pilots and information as to river stages.

At New Orleans the ends of the two supporting barges were partly submerged by redistribution of their ballast, the lashings were released, and the barges were drawn away by a slight pull of a tugboat.

Righting the caisson

The next problem was to place the required amount of permanent ballast in order to right the caisson and bring it to the specified draft. The volume reserved for permanent ballast was strictly limited by the prescribed contour of the main and wing tanks. Concrete made with steel punchings was prescribed for the main tanks, while in the wing tanks heavy concrete was placed in the bottom and ordinary concrete at the top. During the righting process careful watch was kept over the caisson since its stability decreased as it changed from the horizontal to the vertical position. When it reached a vertical position its draft was about 29 ft. and the shifting of men on the deck threw it out of plumb. When the ballasting was completed and all deck equipment had been installed the fresh-water draft was 32 ft. 8 in.

Inclining experiments were made before taking the caisson down to the Gulf, a total of 18 tons of weight being shifted on the upper deck. The metacentric height thus obtained was in close accord with the preliminary calculations.

The caisson was taken in tow by the tugs "Edmond J. Moran" and "W. G. Coyle" and reached the Gulf through the South pass. There, water ballast was added in the aft wing tank so that a "drag" of approximately 6 ft. was obtained.

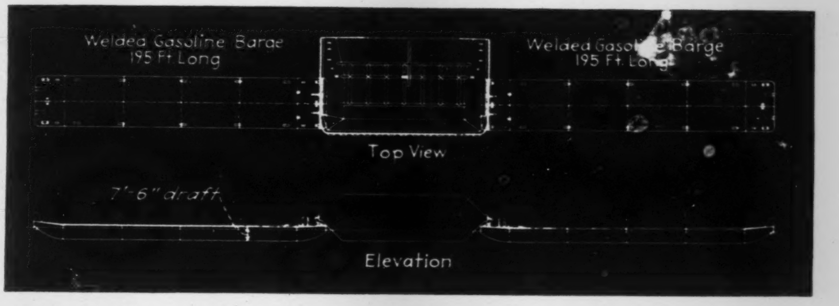


Fig. 3. For its movement down the Ohio, the caisson was floated between two barges which were so placed with respect to its center of gravity that its draft was practically uniform, averaging 7 ft. 6 in.

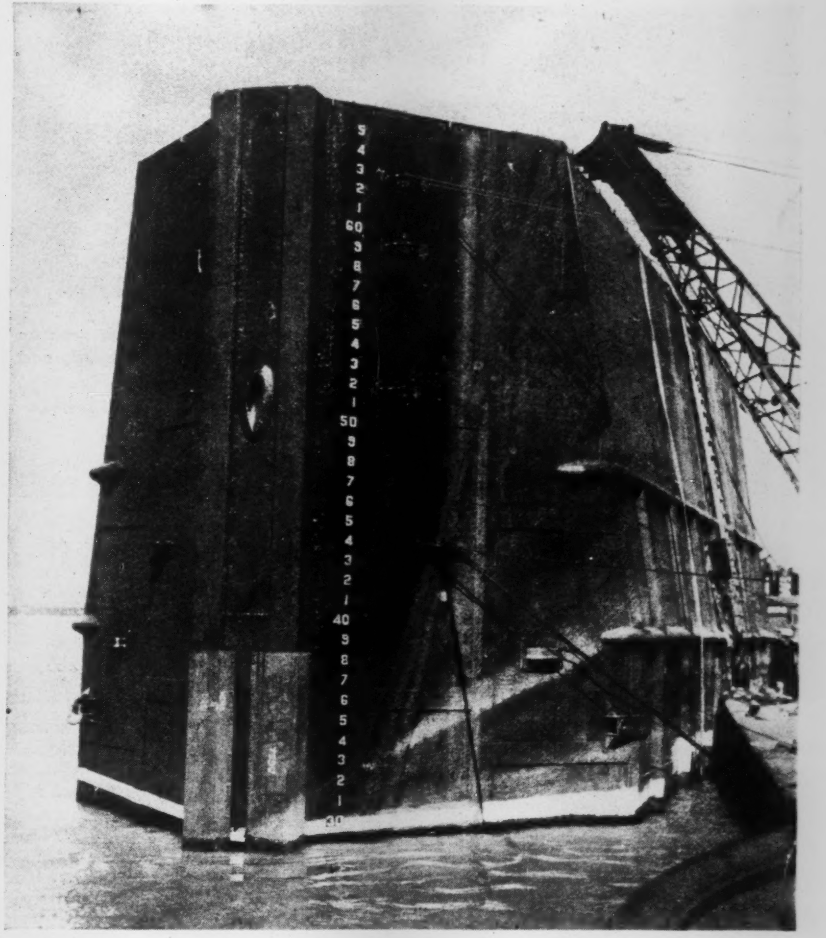


Fig. 4. At New Orleans the caisson was righted and the deck equipment was put in place. It was floated to Panama in upright position.

The tug "Edmond J. Moran" towed the caisson to Panama Canal. Due to stormy weather and rather poor seagoing qualities of the caisson, some difficulties were experienced during the voyage. The caisson pitched and yawed and the towing bridle chain broke in one instance. No damage was done to the caisson except peeling off some of the paint.

Upon arrival at the canal, final adjustment of shafts and pumps was made under the supervision of a representative of the Dravo Corporation, the builders.

Sinking and seating operations as well as raising of the caisson were performed to the satisfaction of the representative of the Navy Department after which a formal acceptance of the caisson by the Panama officials took place.

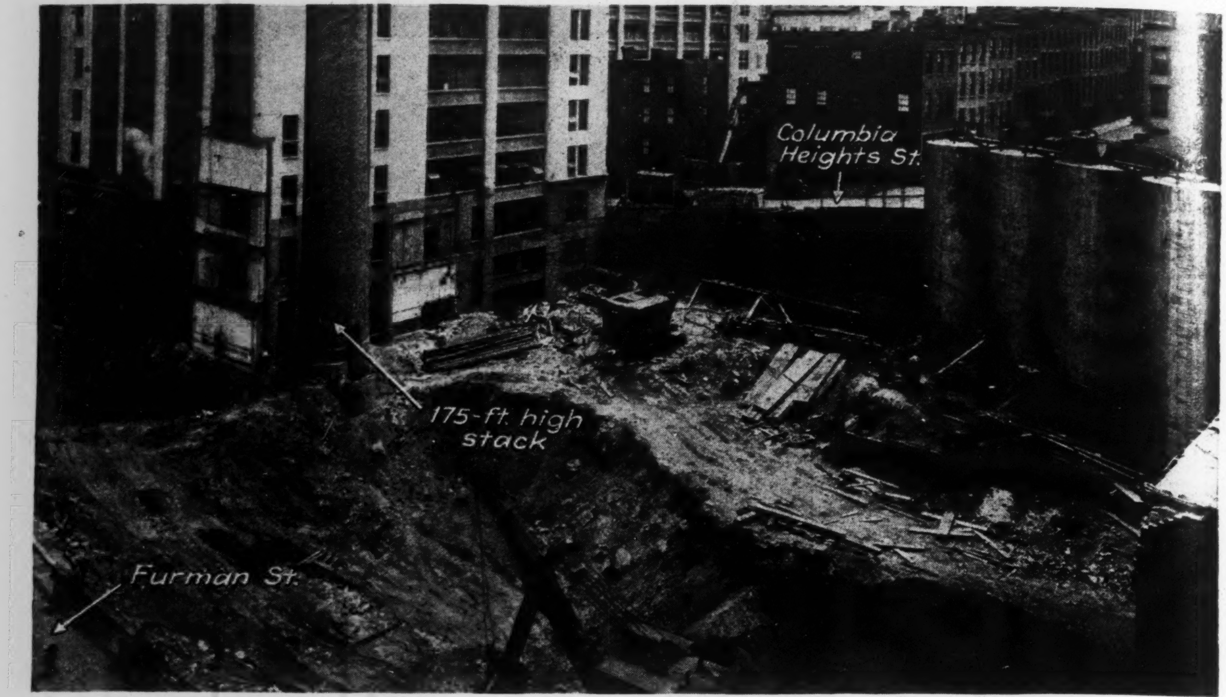


Fig. 1. This early view of site shows three neighboring structures that created unusual foundation problems. Structures are 175-ft. smoke stack at left; 100-year-old retaining wall in background; and active tank storage at the right center.

Nearby Structures Create Unusual Foundation Problems for New Building

***Contents in Brief**—Use of a stepped back cellar with line wall loads carried on piles and unusual retaining walls solve difficult foundation problems for New York building. Nearby structures, including 175-ft. high smoke stack, not affected by the new construction.*

BECAUSE OF A NEIGHBORING retaining wall reputed to be at least 100 years old, a nearby storage tank yard that had to be maintained, and an adjoining 175-ft. high smoke stack, unusual foundation work was required for the new E. R. Squibb & Sons building on Furman St. in Brooklyn, N. Y. The building, which is of reinforced-concrete frame construction, consists of a 142x84-ft. 12-story and basement structure with a 63x84-ft. 6-story and basement wing.

Borings at the site, which was covered by boulders and old masonry, disclosed that at 10 ft. below the foundation of the former buildings there was a good sand considered capable of carrying 3 tons per square foot. In addition, the borings revealed that there was no sign of water 10 ft. below the level of the East River only 160 ft. away. Thus, it was decided to use as a foundation a 3-ft. reinforced-concrete mat on the sand. The unusual methods of protecting the surrounding structures are of special interest.

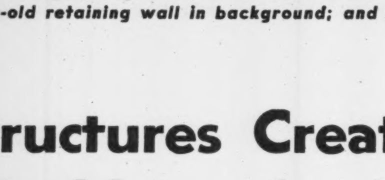
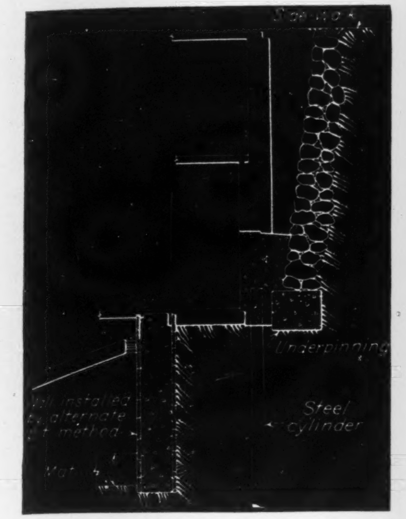


Fig. 2. Plan showing outline of foundation mat for new building and surrounding structures that had to be protected during construction.

Columbia Heights St., forming the site's east boundary (Fig. 1), slopes up to the south at about a 10 percent grade so that it is about 40 ft. above the Furman St. level or west boundary and 55 ft. above the foundation mat planned. The existing retaining wall of dry rubble along the Columbia Heights side extended down to only about 15 ft. above the mat. Since the wall could not be underpinned down to the mat level and supported laterally except at enormous expense, it was decided to step back the cellar for the new building 10 ft. and carry the structure's line wall loads to grade by steel piles, which had to be driven open-ended due to the compactness of the sand in that area.

Such a plan made necessary construction of a new wall 10 ft. away from the older one. Because the new

Fig. 3. Drawing below shows construction along Columbia Heights St. Rubble wall at the top is over 100 years old. Since it could not be underpinned, without excessive expense, to the level of the foundation mat, the wall for the new building was stepped back as shown.



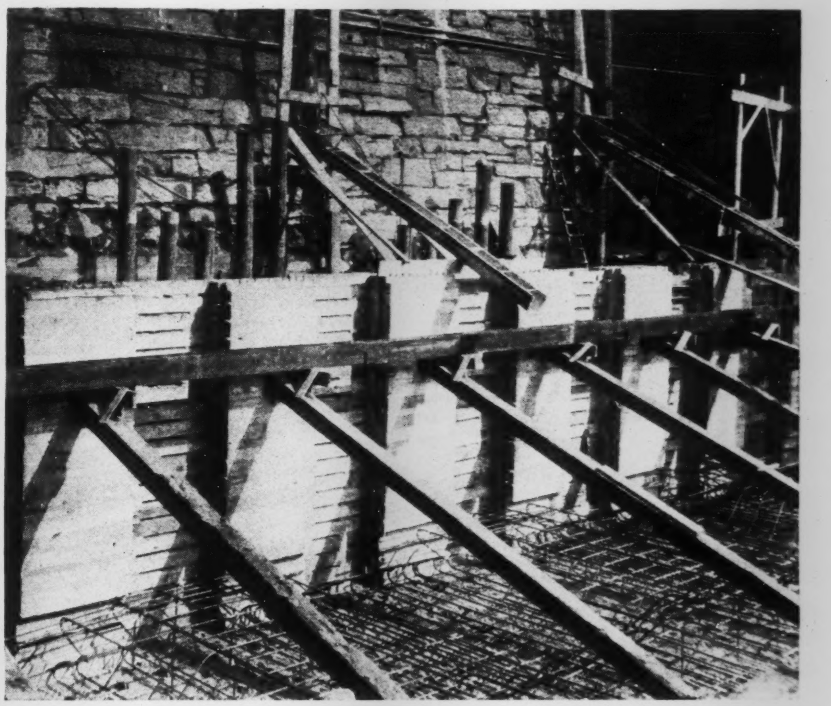


Fig. 4. New wall along Columbia Heights St. is constructed by building alternate sections in 3x5-ft. pits, installing louvre boards between those sections as excavation is carried out, and then constructing by normal methods a 1½-ft. wall between the portions built in the pits.

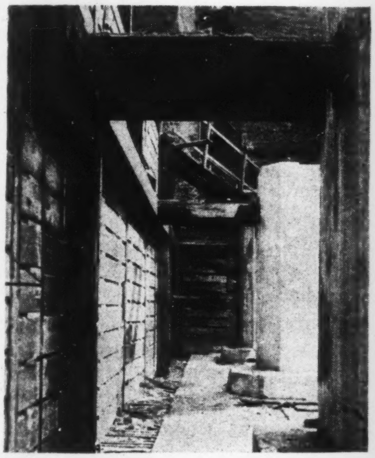


Fig. 5. Position of temporary wall along tank area in place at left and first row of column for new building completed at right. Just outside the permanent columns a 1-ft. thick reinforced concrete wall will be built.

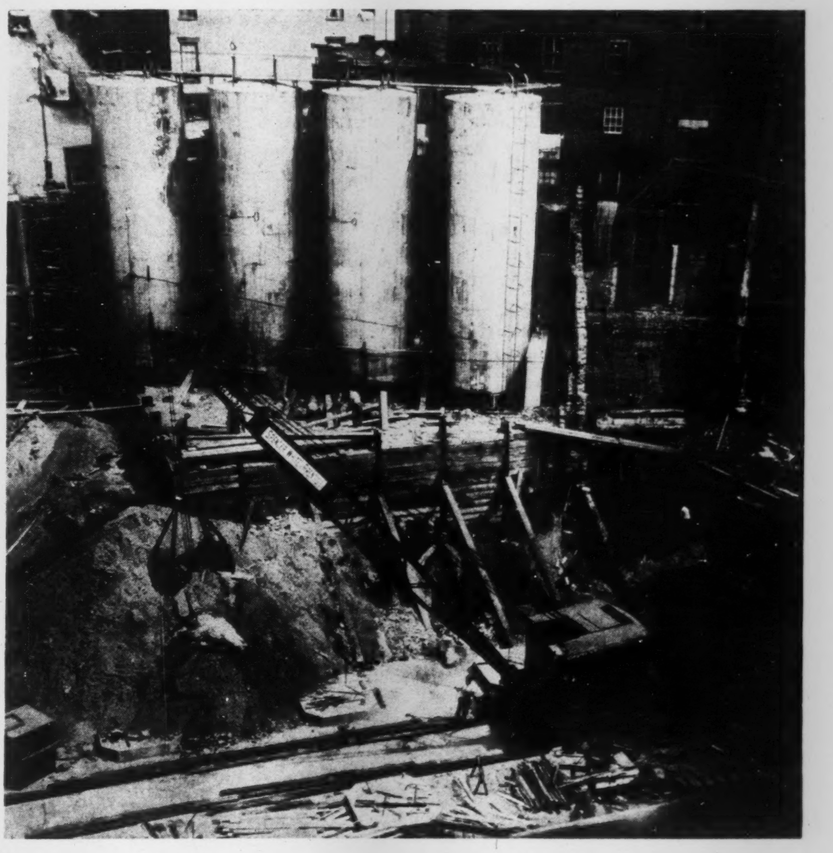


Fig. 6. Indicating how loss of ground in tank area was prevented.

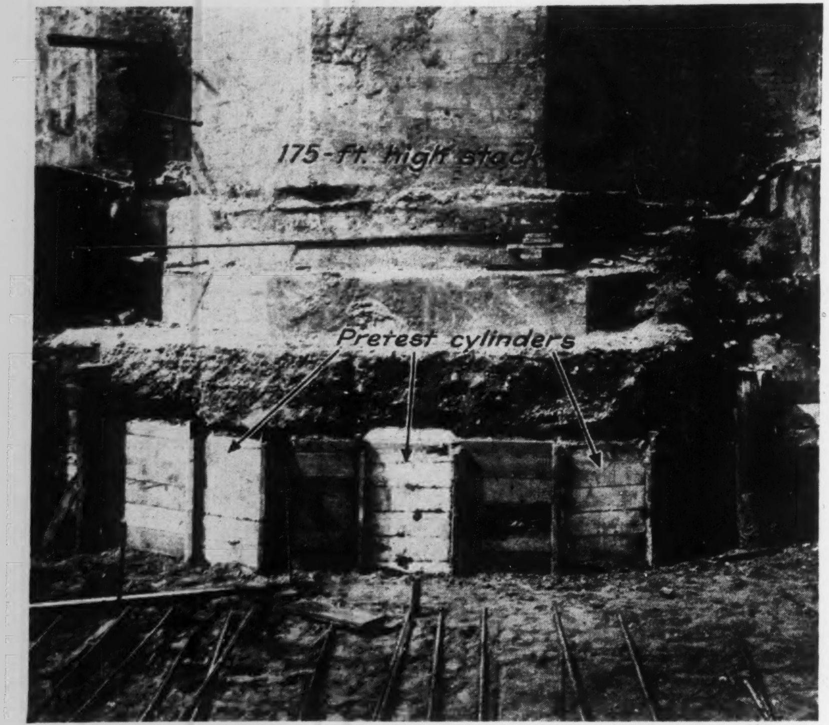


Fig. 7. Support lost by excavating near 175-ft. high smoke stack is replaced by three Pretest cylinders (now encased in concrete) tested to 80 tons each.

structure, which was to extend from about level with the older wall's base down to the mat, had to be built without loss of ground, a difficult problem arose. The original plan was to use steel sheet piling for the new wall, but anticipated difficulty in driving the piling through the coarse sand and boulders in the upper soil resulted in construction of a reinforced-concrete wall in alternate 3x5-ft. pits dug to final excavation level. As the wall sections were completed they were braced by shores leading down to that portion of the mat that could be built without disturbance of those structures surrounding the site. Then the berm was removed and horizontal louvre boards installed in the 5-ft. intermediate spaces as the excavation advanced. Finally, a 1½-ft. thick reinforced concrete wall was constructed between those portions of the wall built in the pits (Figs. 3 and 4).

Protection of tank area

Due to the necessity of maintaining storage of cod liver oil in four 25,000-gal. tanks in an adjoining area at the site's southeast corner, the building was stepped back at that point also. Along the edge of the tank area the ground level is 30 ft. above Furman St. and 45 ft. above the mat's bottom. The ground supporting the existing tanks had to be maintained and foundations had to be provided for three additional units in the tank yard. This was accomplished by first driving 12-in. H-sections on 7-ft. centers around the yard and to a depth of 5 ft. below the mat's subgrade. Next, inclined shores were placed between the H-sections and the completed portions of the concrete mat. Once the H-sections and shores were in place, the berm was removed with a clamshell bucket and horizontal louvre boards installed between the H-piles as the excavation advanced. A small space between the boards was an essential feature, since it was through these openings that material could be stock rammed to prevent loss of ground.

Final construction along the tank area for the new building consisted of a row of 5x5-ft. columns with 8x8-ft. drop panels on 21-ft. centers. These columns were about 9 ft. away from the wall of louvre boards. With completion of the columns the load from the H-piles was transferred to these columns by installation of short struts and removal of the inclined braces. A 1-ft. thick, reinforced-concrete wall, roughly 20 ft. high, was then built just outside these columns. Although the space between the wall and the louvre boards was backfilled, the short struts were left in place to give the fill time to consolidate.

New tanks in the tank area had to be supported on 16 in. open-ended steel piles driven below the bottom of the adjoining mat. Boulders and old walls rendered the driving of the piles extremely difficult. In one case a buried steel tank encased in concrete was penetrated by cutting away its top and driving a heavy steel spud through the steel and concrete bottom. Removal of the spud left an opening through which the 16-in. pile could be driven to sub-grade.

Stack base 4 ft. above mat

A third major problem was the protection of the 175 ft. high brick stack on the north, founded on an octagonal base bearing on the soil at an elevation about 4 ft. above the bottom of the mat. Complete underpinning of this was apparently so expensive that it was originally planned to confine the sand below the base by means of steel sheet piling. The difficulty of driving as disclosed in the foundation piles caused the architect to fear that the vibration might be dangerous.

It was decided to underpin only the front of the mat by means of three Pretest cylinders. Excavation was carried in louvred pits below the mat, and sectional cylinders 16 in. in diameter driven hydraulically to a test load of 80 tons per cylinder, 50% higher than the required capacity. The material within the shells was removed with special tools, and the cylinders filled with concrete. The test load was reapplied to the cylinder and a steel strut wedged in place between the jacks. Finally, the tops of the cylinders and wedging struts were encased in concrete. Between the cylinders, the earth was confined by means of horizontal louvre boards wedged in place. In this way vibration was entirely eliminated, and the original bearing area extending well into the new work due to arch action, replaced by 240 tons of additional support.

For the new structure, the Turner Construction Co. was the general contractor, while Spencer, White & Prentis, Inc., held the contract for the underpinning and foundation work. Abbott, Merkt & Co. were the engineers. F. W. Nitardy, vice pres., was in charge for E. R. Squibb & Sons.

Army Tries Out Cableway Bridges

Contents in Brief—*New design consisting of welded tubular steel towers, cable and anchorage systems can be stowed on two trucks, erected in 3 hr. and can transport fifteen 13-ton vehicles per hr. in slings suspended from the cableway carriage. Entire main span cable is lowered and raised when handling loads. Useful for advance units of motorized forces. Eliminates difficulties of steep banks and swift flowing water that restrict use of pontoons.*

UNLESS AIR SCOUTS are particularly observing they will fail to detect the river crossing movements of some of our new mechanized forces in the current war games in the South. For instead of the easily-seen pontoon bridge the army will be using a new military cableway unit that is practically invisible from safe flying altitudes. The cableway has many other potential advantages which the maneuvers will weigh for the first time to determine the usefulness of this method of bridging in actual warfare.

What the cableway can do

Invented last fall by Lt. Col. R. B. Lord of the Corps of Engineers, the cableway can be stowed for transport on two truck trailers, can be assembled in any span up to 1000 ft., and can handle fifteen 13-ton vehicles per hour; if two cableways are used side by side 27-ton tanks can be carried. In a test last April at Fort Riley, Kansas, of the first unit built, erection was accomplished in three hours by a crew of 53 men.

With these potential advantages it is hoped that the cableway will meet the army's need for a type of bridging equipment requiring little road space for transport; that is light in weight, highly mobile, easily and quickly erected, low in cost, and that requires only a small crew for erection and operation. Furthermore, from a tactical standpoint, the cableway eliminates the river bank and approach problems that affect pontoon bridges; it makes advance reconnaissance for suitable river crossing sites unnecessary; it permits flooded rivers or dry canyons to be readily bridged; it is a difficult target for artillery or air bombing; and it is easily camouflaged.

Details of the cableway as now designed are shown in Fig. 2. It will be noted that the principle of operation involves lowering the main span cableway rope until lines from the cableway carriage can be attached to the vehicle to be transported; then upon raising the cableway until the load clears the ground the carriage with its suspended vehicle can be hauled across the stream.

Towers, cable and carriage, equalizer rope anchorage system, a lifting winch and a hauling winch, both on trucks, comprise the equipment. The towers are of welded tubular steel 40 ft. high spliced at mid-height and sealed so that they may be floated across a stream. Guy ropes hold the towers in an upright position. The cableway line passes over sheaves on top of the towers and is connected at either end through a system of equalizer ropes to a group of eight special anchors that are readily installed by hand tools.

At one end, however, the cableway-equalizer connection is through a ten-part tackle with a lead line to a winch on a truck, and it is through this tackle that the main span cableway rope is lowered and raised to take on, transport and discharge the load. The 13-ton net load capacity is based on a 7 percent cable sag and a 3 to 1 safety factor; greater sags and lower factors of safety would increase the capacity for a given span proportionately, provided the carriage could take the extra load. The carriage consists of roller bearing sheaves front and rear which support transverse I-beams from the ends of which the four carrying slings are suspended.

Cables required

A standard 17x19 wire center plow steel cable of 1⅝ in. diameter is used for the main span. Equalizer and anchor cables are of sizes necessary to carry the stresses transmitted to them by the main cable. Each anchorage is designed for an ultimate strength

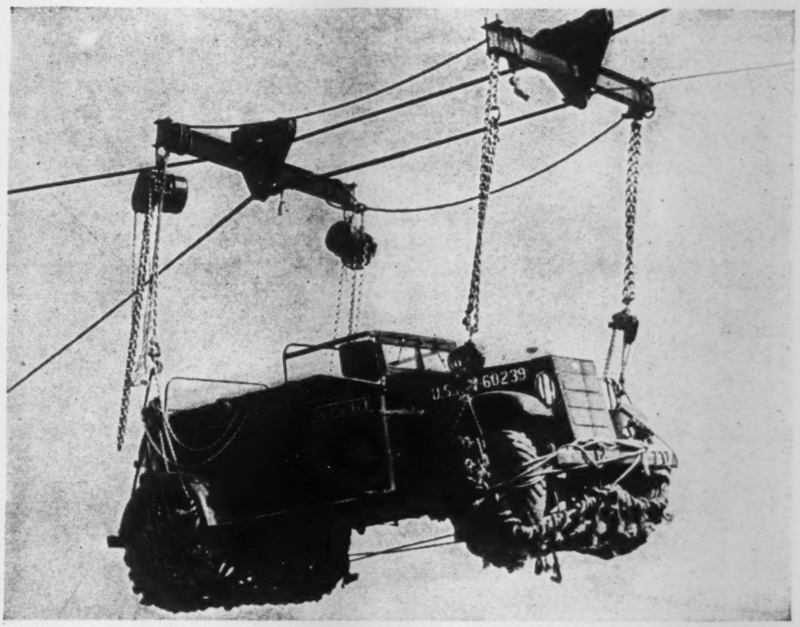


Fig. 1. Scout car being transported across a stream by the Lord military cableway. The main cable, upon which the ball-bearing sheaves of the carriage ride, is slacked off to lower the scout car to the ground. Then, freed of the rope cradles or slings the car can move off under its own power.

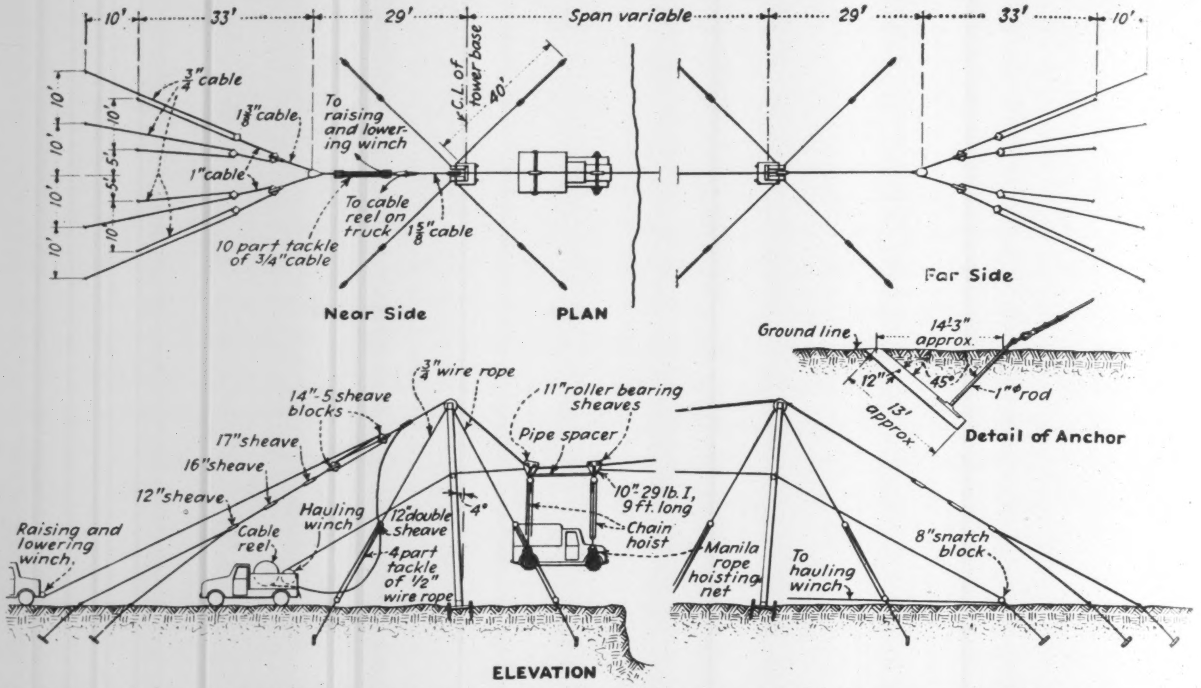

10'
33'
29'
Span variable
29'
33'
10'
10'
10'
10'
10'
10'
10'
5'
5'
10'
$\frac{3}{4}$" cable
1$\frac{3}{8}$" cable
1" cable
10 part tackle of 3/4" cable
To raising and lowering winch
To cable reel on truck
1$\frac{5}{8}$" cable
C.L. of tower base
40'
Near Side
PLAN
Far Side
Ground line
14'-3" approx.
12"
45°
1"φ rod
13' approx.
Detail of Anchor
$\frac{3}{4}$" wire rope
14"-5 sheave blocks
11" roller bearing sheaves
Pipe spacer
17" sheave
16" sheave
12" sheave
Raising and lowering winch
Cable reel
Hauling winch
12" double sheave
4°
4 part tackle of 1/2" wire rope
10"-29 lb. I, 9 ft. long
Chain hoist
Manila rope hoisting net
To hauling winch
8" snatch block
ELEVATION

Fig. 2. Details of cableway that can be transported on two trucks and erected in three hours. Main cable, anchored through equalizer cables, is lowered to take on and discharge loads and is raised while vehicle is in transit.

of 50,000 lb. in hard clay soil or 20,000 lb. in river silt. Under the worst possible conditions, therefore, the eight anchors provide for a tensile stress in the main cable up to 160,000 lb. without fracture of the earth or of the anchor. A special anchor is provided for rock.

To erect the cableway, the equipment trucks and work crews drive up to the desired crossing point. The equipment is unloaded, and tower crews, lead lines and snatch blocks are crossed to the far side by assault bolts or by swimming; or by climbing, if the obstacle is a dry ravine.

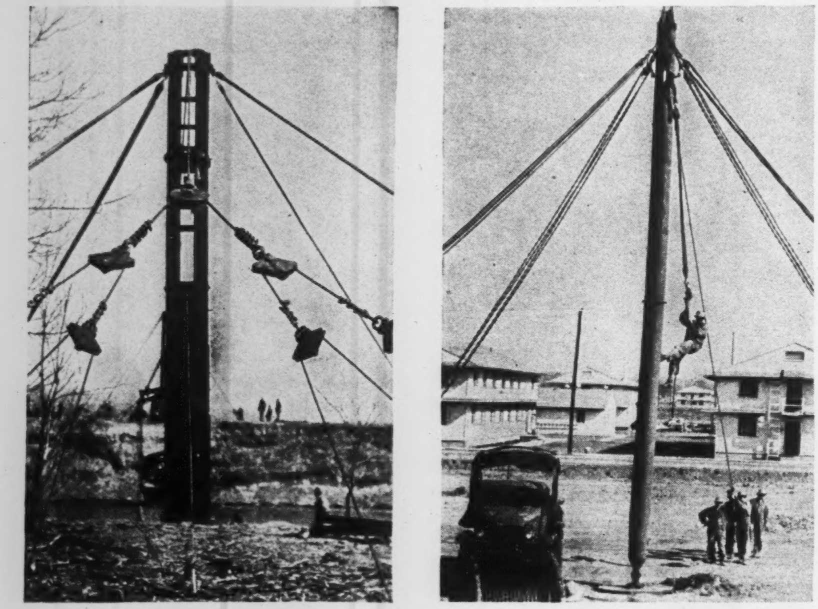


Fig. 3. On the initial cableway, built for experimental purposes, the towers were of timber (left), but the present design uses the welded tubular steel column, shown being erected at the right. The equalizer cables of the anchorage system are unchanged in the adopted design.

The snatch blocks are anchored on the far shore and the lead line is brought back to the near side. Using the snatch blocks on the far side and power from the equipment trucks on the near side, one of the towers is floated or dragged across, raised and anchored. Then with both towers raised and guyed, the steel cable is passed over the tower sheaves and connected to the equalizer and anchorage system.

How the cableway functions

For the transmission of vehicles the cable, with trolley and slings attached, is lowered; vehicles drive onto the slings, and the cable is raised to the operating position. By the use of the lead lines, blocks on the far bank and truck tower on the near bank, the load is moved over the river or ravine. When the vehicle reaches the far bank, the cable is lowered until the slings touch the ground, and the vehicle moves off under its own power.

The preliminary test indicated that the cableway would transmit 15 complete loads per hour over a span of about 400 ft. For longer spans the time required would not be appreciably greater since the actual transmission of the load could be as rapid as 15 miles per hour once it is in position on the cable.

Experience Dictates Incinerator Design

D. F. Harvey,
City Engineer, Beaver Falls, Pa.

***Contents in Brief**—Records from an incinerator operated since 1909 provided essential basic information for the design of a new plant at Beaver Falls, Pa. Two 30-ton furnace units have been installed, only one of which will be needed during the winter months. Garage facilities adjacent to the incinerator building provide centralization of disposal activities at one point.*

When Beaver Falls, Pa. decided to build a new incinerator to replace a plant that had been in operation since 1909, design considerations were simplified because of the accurate records of refuse production which were available over a long period of time. Previous experience, likewise, dictated the wisdom of building a garage and repair shop for collection trucks adjacent to the incinerator plant so that all street and refuse disposal facilities would be centralized.

The new facilities, which were placed in operation last April to serve this city of 17,500 people, include two 30-ton furnace units, and garage space for 16 trucks, a power grader, street sweeper, 10-ton roller and other smaller equipment of the street department. The garage building is a one-story brick structure, 45 ft. 9 in. by 154 ft. long. In one end of the building space is provided for the office of the street commissioner, a lavatory, oil room and tool room. Space has also been provided for a repair shop with pit, truck washing, and street sweeping equipment storage. The general storage area for other departmental equipment is about 44 by 88 ft.

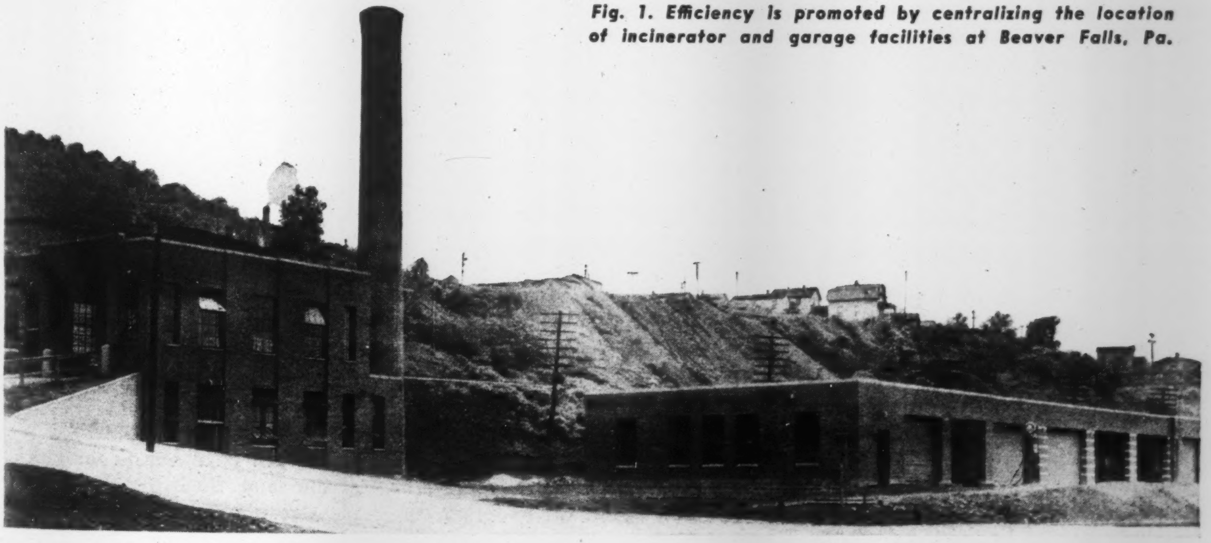
The incinerator building is a 30-ft. 9-in. by 50-ft. 3-in. brick structure with a charging floor 14 ft. above the stoking floor; this gives ample space for access to the top of the furnaces. The door to the charging floor is 14 by 14 ft. to give ample side and overhead clearance; this door is of the steel roll type, electrically operated. The total cost of the incinerator was $43,000, and the cost of the garage building was $25,000.

The old incinerator, which cost $16,000 when it was built in 1908-09 by Lewis & Kitchen of St. Louis, Mo., was costly to operate because of the coal required to supply additional heat for the incineration of garbage. During the past years the cost of coal alone was about $2,400 per year.

The incinerator design, prepared under the supervision of C. L. Todd, manager of the incinerator department, Pittsburgh-Des Moines Steel Co., called for the construction of two 30-ton units, based on the average daily per capita production of garbage and rubbish which is 1.21 lb., and which must be incinerated in a period of 310 working days per year. Yearly production of garbage in Beaver Falls averages about 3,860 tons. The lowest daily average of some 10 tons is collected in March and the heaviest daily average is about 18 tons collected in the month of September.

Monthly variations in tonnages collected each working day are shown in Fig. 2. From this it will be seen that a furnace whose rate of capacity is 10 tons in eight hours will incinerate all the refuse for six months of the year and, allowing for reasonable excess capacity, a single unit of this rated capacity will take care of all the refuse delivered during about one-half of the year. It was on the basis

Fig. 1. Efficiency is promoted by centralizing the location of incinerator and garage facilities at Beaver Falls, Pa.



of these facts that a decision was made to construct an incinerator with two separate units, each having a capacity of 30 tons in 24 hours.

The furnace is of the all-steel jacketed type, with 4½ in. of solid insulating brick around the interior steel jacketed walls and 2½ in. of similar insulation for all the arches and floors of the combustion chamber, flues, and outer walls composed of 12 in. of common brick or concrete. The furnaces are provided with carborundum tubular air preheaters so that air to be used for the purpose of combustion can be brought to a temperature of about 400 deg.

Preheaters of "two-pass" type

Each furnace is provided with its own air preheater and forced draft equipment. The carborundum preheaters are of the "two-pass" type. At the rear of each preheater chamber in the section leading from that chamber to the manifold flue an alloy steel damper is located. The damper serves to provide in part for the proper control of the gas flow from the furnace and to retain the heat during waiting periods. Damper operation is controlled by means of flexible cable and winch located convenient to the stoking area.

The charging hole into each furnace is 36 in. in diameter, and of ample size to permit free passage of the large packing cartons which make up a considerable portion of the combustible refuse delivered to the plant; barrels and large boxes also can be fed through this hole directly into the furnaces. The charging holes are covered with pivoted cast iron covers thoroughly insulated.

An 83-ft. high radial brick stack (Fig. 1) provides a good natural draft for the furnaces. The stack is fully lined from top to bottom and, in addition, has a 4½-in. fire brick target wall to take the direct impact of the gases from the flue. This lining is independent of the shell and its stability is assured by an outer "corset" of 2x⅜-in. steel bands in both vertical and horizontal direction.

The rated capacity of each furnace is 1¼ tons per hour. During the test of the furnaces by the Pittsburgh-Des Moines Steel Co. on March 25, garbage was incinerated at the rate of 3¼ tons per hour. Thus the performance was well above the 2½ ton per hour guarantee rate. Good operation is also indicated by the fact that during the past few months not more than four or five bushels of coal have been required, and this was needed only in cases when the delivery of garbage to the plant was delayed because of collection difficulties.

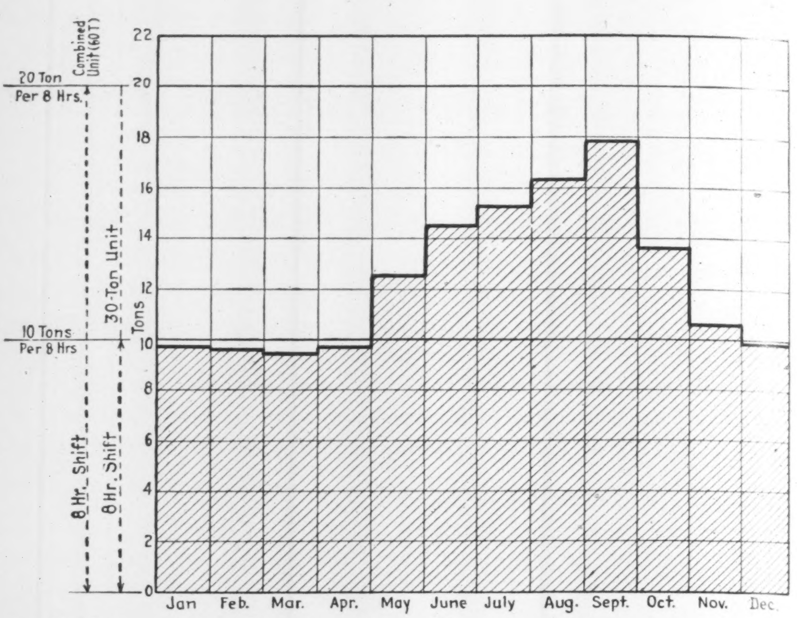


Fig. 2. Average number of tons of refuse to be incinerated per working day (310 per year) at Beaver Falls (pop. 17,500). Superimposed on the diagram is the rated capacity during 8 hr. for one and two furnace units; rated capacity of a single unit is sufficient to incinerate refuse during 6 months of the year.

General contract for the two buildings was held by Mathew Leivo & Sons of New Castle, Pa. Incinerator and chimney construction were handled by the Pittsburgh-Des Moines Steel Co. of Pittsburgh, Pa.

City-Owned Utilities to Make "Tax" Payments

City-owned water and electric utilities will "pay taxes" this year in Glendale, Calif. By transferring approximately $300,000 to the general city government from the operating revenues of the public service department, the city will be repaid to a large extent for the tax loss taken because the utility property is not privately owned. Though the amendment does not require it, the city will pay normal rates for services rendered by the water and electric utilities.

The policy of transferring funds was authorized by a charter amendment adopted in April, 1941, by a 2-to-1 vote of the people, according to the International City Managers' Association. The amendment authorizes the city council each year, on or before the time of adopting the budget, to reduce the amount or waive the transfer if necessary in order to assure the sound financial position of the public service department.

The new policy grew out of a three-year study of the financial relationship between the public service department and the general city government, the Association said. After an analysis of the financial status, physical condition and future plant requirements of the utilities, the city manager recommended to the council that the utilities pay the city an amount at least equivalent to taxes that would be paid if they were privately owned. It was pointed out that the public service department could make such payments to the city and at the same time provide for future plant requirements and make reasonable rate reductions.

Notes on the Waterworks Meeting

Reflecting current concern with problems created by defense measures, the convention of the New England Water Works Association held at Boston, Sept. 23-26, laid stress on priorities problems, postwar programming of public works and organization of state wide facilities to cope with emergency conditions. The program also included papers dealing with earthquakes, effects on distribution systems, water conservation in New Hampshire and plant operating experiences.

Following are extracts from some of the papers and discussions. Officers elected and other general news of the convention were given in a report published in the October 2 issue, page 455.

Priorities and waterworks

Procurement of materials is a vital problem with everyone these days. Because national defense requirements have taken a striking rise from a five billion dollar output in 1940 to a projected thirty-five billion dollar total in 1943, materials must be diverted from their traditional and accustomed channels to new paths of production. Hence we have a priority system, which is simply a method of confining to certain emergency groups the power to establish preferential lines of travel for scarce materials.

No one can question the fact that defense production in any industrial center requires adequate water supply, fire protection and good health conditions. These things the public water supply system provides. Those in authority recognize this special status and are, as rapidly as administrative procedures can be established, defining the preferred position in procurement to be held by water, electric, gas, heating and sewer systems. As an example, the recent (Sept. 17, 1941) Maintenance and Operation order (P-46) sets up certain preferred positions for these services. And the Project Rating system put into effect by the Office of Production Management makes it possible for a major waterworks extension required to supply defense industries, housing or training centers to be given adequate preferential rating so that the work can be completed.

There is much talk of use of substitute materials or materials giving a shorter time of useful service than the standard specification materials. No group should be more conscious of this possibility than the Army and Navy personnel. Regrettably, much high grade long-life specification material has gone into army camps and the like. Regrettably, also, civilian long-term requirements are sometimes shunted off into the inferior or substitute materials—such as the ill-advised suggestion to the head of a water department that for a supply line designed to operate under 150 lb. pressure the requested steel not be used, but terra cotta pipe be laid.

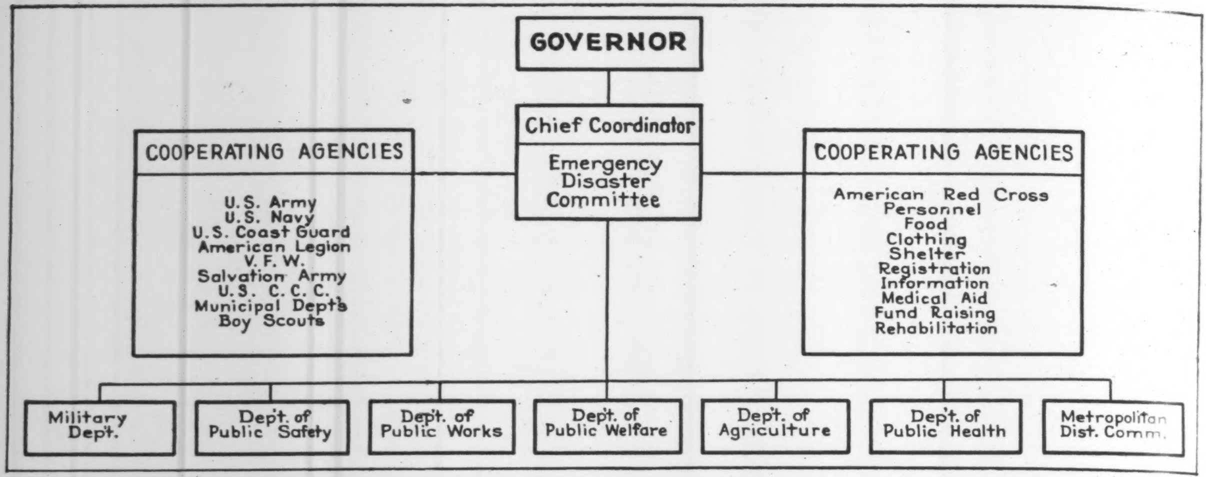
There are many useful substitute materials. Many can be used in water supplies. The metal in some of the materials which have been available for waterworks use only in the past ten years can be devoted to more imperative needs. Water plants can get along with many things they formerly found satisfactory, which have been displaced by newer, higher grade materials. But there is every reason why temporary military projects should also be adjusted to the same pattern. There is simply no sense in the laying of heaviest grade cast iron pipe in a temporary training center and allowing permanent public water supply only secondary, light-weight or short-lived material. This is a practical attitude involving payment by the "public" for material used in either case. The citizens should get the most for every dollar they are having spent for them in permanent structures and services and not invest in 100-year material for use in a 10-year-life project.

It is clear that information concerning all over requirements of public services is going to be studied and used as the basis of allocations in the future. The American Water Works Association has been asked to provide such data to cover the waterworks field. Information is being prepared upon the basis of returns now in hand covering over 40,000,000 out of 82.5 million persons served by public water supplies. The facts are being organized upon the basis of requirements per 1,000 persons served so that they can be applied to all urban water supplies. Even the storage practices upon the same population basis are being analyzed so they can be shown just how much pipe, valves and fittings in tons are required as an emergency inventory to keep the plants protected against unforeseen breaks and shutdowns.—HARRY E. JORDAN, *secretary, American Water Works Association, New York, N. Y.*

Emergency organization

Massachusetts has a state emergency plan based on a military system, which is organized to function under the governor as commander-in-chief in any emergency whether it be the result of a conflagration, flood, hurricane or attack by enemy forces. This organization was in operation during the hurricane episode of 1938 and has since been expanded to include the advice and assistance of all state departments, municipal departments and military, civic and welfare groups.

The Department of Public Health functions under this plan, not only through use of all the personnel and facilities of the department but also by having as chief engineer a member of the state military staff. As a part of the plan, leading water supply officials of the state have been appointed civilian members of the state staff with the title of water supply coordinator. Through the activities of these coordinators the water supply systems of the state have been adequately mapped, material and equipment are being inventoried and



Organization chart of the Massachusetts state emergency plan which provides for assistance from all state departments, municipal agencies and military, civic and welfare groups.

facilities are being provided to render aid from one water department to another and to overcome subversive activities or sabotage. To assist in the procurement and distribution of water supply equipment, materials and chemicals, two civilian water supply coordinators have been appointed from the ranks of the manufacturers to work under the state emergency plan. Any emergency plan must have a working organization in order to function properly. Massachusetts has both the plan and the organization (See chart on this page.) and has authority under the military laws of the commonwealth to function effectively.—Arthur D. Weston, *chief engineer, State Department of Public Health, Boston, Mass.*

Earthquakes and water systems

A widely employed principle of engineering design is that provision must be made for the unpreventable natural phenomena such as wind, rainfall and earthquakes. To rationalize this matter represents a difficult problem, perhaps particularly with respect to earthquakes. So far as water distribution systems are concerned, good construction will not be subject to serious damage from the most violent earthquakes provided that certain special conditions are recognized and precautions taken. The subject of this paper was suggested by reason of a recent earthquake of noticeable severity in New England.

To define those conditions and to suggest effective methods of meeting them, a study was made of California experiences with earthquakes in the San Francisco (April 18, 1906) Santa Barbara (June 29, 1925) and Long Beach (March 10, 1933) areas. From this analysis it was concluded that among the more important provisions which should be made to minimize earthquake danger and damage to water distribution facilities are the following:

> All main pipe lines, pumping plants, reservoirs and elevated tanks should be located to avoid threatening geologic faults.
>
> Where main pipe lines must cross faulted planes, the pipes should be joined with flexible joints and suitable supports in roomy tunnels or surrounding reinforced concrete structures.
>
> Pipe systems in areas subject to serious disturbance should be segregated as to make it possible to separate them from the remainder of the system without delay.
>
> All cast iron pipe lines should be provided with well-caulked lead or cement joints of maximum possible depth.
>
> Elevated steel tanks must be provided with ample tie rods or members of adequate cross section strongly anchored to the main supports which they are intended to stiffen.
>
> Service pipes should lead from corporation cocks of a heavy type, and be provided with flexible goose-necks at the mains.

California experience indicates that major damage to water distribution systems may be caused by falling walls, as at Santa Barbara, which destroyed street mains and everywhere, by the shifting of poorly constructed buildings, caused the breakage or shearing of service pipe.—Charles G. Hyde, *professor of sanitary engineering, University of California, Berkeley, Calif.*

Public works programming

Ever since 1931, in accord with the provisions of the Federal Employment Stabilization Act, the regular capital expenditures of federal departments have been required to be programmed by the department heads on a six-year basis. Responsibility for the administration of this programming now rests with the National Resources Planning Board. The latter, three years ago, began development of a procedure for lange-range planning of public works by states and municipalities. From demonstration studies carried out in seven cities, a basic procedure was developed calling for the application of organized foresight in developing state and municipal budgets for capital outlays. Policies by which to guide forecast decisions are related to debt structure, to the tax rate, to the degree of need that exists for certain public improvements, and to general trends in national and international affairs.

The post-emergency problem is the largest imponderable though ponderous factor involved in laying out long-range programs at the present time. If we assume a sudden peace followed by prompt demobilization and cancellation of contracts for defense production, we can readily visualize a critical period of readjustment from war production to normal peacetime production characterized by the unemployment experience under similar conditions following the Armistice in 1919. However, it may be unreasonable to make such assumptions for several reasons: First, the expenditures already committed for the naval expansion probably will continue for a good many years until the program is complete, because the need for a two ocean navy has been shown; to a considerable extent a similar result may probably be expected with the army, for many and various reasons related to the policing of the post-war reconstruction period.

However all these factors may be handled, there will be nevertheless a transition period full of complexities and reemployment problems. It will be wise to know all possible types of useful employment, especially in those categories paid for out of public funds. This knowledge was not available for 1933 when an emergency program was suddenly developed to meet a critical unemployment condition.

The federal government is taking active steps to prevent a repetition of such a situation. Long-range programs and capital budgets adopted by cities and towns furnish the means to this end. A community that has a six-year program of needed public improvements carefully prepared and always on record will never be at a loss what to do if an emergency program becomes necessary. If some of these projects have already had detail plans completed—a policy it would be well to develop—the program could be started almost immediately.

It is the aim of the federal government, through the National Resources Planning Board and in the related Public Works Reserve Projects (sponsored jointly by the NRPB and the FWA) to develop these local six-year programs in every city and town in the country and by state governments as well.—William Stanley Parker, *chairman, Boston City Planning Commission, and consultant, National Resources Planning Board.*

Discussion: Mr. Parker limits the feasibility of long-range budgeting to normal conditions. The question may well be asked as to what may be considered normal conditions. Has the federal program of public works construction under PWA and WPA or other alphabetic notation, registered such conditions, and how can that program, if continued, be fitted into an orderly forecast of municipal financing?

In various municipalities necessary improvements are held up pending guarantee of federal aid; in others, unjustified expansion of utilities has been induced by the opportunities to obtain necessary funds from a source not dependent on local taxation. Since such federal contributions must be met by some form of taxes, it would appear that PWA and WPA—well justified as they may be from a welfare standpoint—are disturbing factors in any scheme of local, long-range planning.

Judging from the economic backwash of the first World War, the years of defense activities will be followed by a considerable period of unemployment and federal taxes higher than those registered in the tax bill recently passed. As a result, municipal budgeting practice will be more concerned in cutting expenditures to the bone than in long-time planning—and this regardless of public convenience as measured by past standards. These comments are not an argument against the adoption of the improved budgeting method proposed by Mr. Parker. They simply indicate that its effectiveness for some years to come will be discounted by continued abnormal conditions.—Frank A. Barbour, *consulting engineer, Boston, Mass.*

Discussion—By taking steps now to plan for public works improvement the construction industry will show itself to be a leader in providing gainful work in the future when a transition is made from defense activities. However, a policy of public works planning which is nothing more than a listing or inventory of desirable projects is not enough; to make such a policy effective for prompt initiation when an emergency arises, communities must have detailed plans and specifications prepared for individual projects.—Malcolm Pirnie, *consulting engineer, New York City.*

Industrial water rates

Analysis and comparison of the published rates of 26 waterworks systems in New England discloses nearly as many different rates as there are systems and many different points of change from highest rates to the lowest. (See tabulation.) In this comparison it seemed advisable to use a basic quantity such as might be needed by a moderately large user of water. This figure was taken as 100,000 gal. per day, or, for a working day-month of 25 days, 333,333 cu.ft. per month. In comparing the point of change in rates, a month of 31 days was used.

(Continued next page)

MUNICIPAL WATER CHARGES TO INDUSTRIAL USERS IN NEW ENGLAND

LOCALITY	Monthly Charge for 333,333 cu. ft.	Gravity or Pumped Supply	Number of Rates	First Rate in Cents per 100 cu. ft.	Point of Change to 2nd Rate (cu. ft.)	Lowest Rate in Cents per 100 cu. ft.	Point of Change to Lowest Rate (cu. ft.)
Augusta, Me.	$208.	G & P	7	20	333	6	33,333
Ayer, Mass.	379.	—	3	41½	222	11¼	1,111
Brattleboro, Vt.	240.	G	3	30	5,000	10	10,000
Bridgeport, Conn.	280.	G	4	15	6,667	6	40,000
Burlington, Vt.	348.	P	3	20	10,000	10	20,000
Concord, N. H.	200.	G & P	10	16⅔	500	7	145,000
Fall River, Mass.	396.	P	14	24	775	10½	217,000
Fitchburg, Mass.	141.	G	3	18	1,667	4	18,333
Hartford, Conn.	307.	G	2	15	93,000	7½	93,000
Holyoke, Mass.	142.	G	1	4¼	——	4¼	——
Lynn, Mass.	405.	—	3	15	16,667	8	416,667
Manchester, N. H.	197.	P	3	10	33,333	5	100,000
Middleboro, Mass.	511.	P	7	19	40,000	10	1,000,000
New Bedford, Mass.	259.	P	5	11¼	3,300	1	666,600
New Haven, Conn.	390.	G	7	50	200	5	750,000
Norwich, Conn.	211.	G	3	25	1,667	6	16,667
Peabody, Mass.	490.	—	2	15	300,000	12	300,000
Pittsfield, Mass.	202.	G	3	12	1,667	6	5,000
Portland, Maine	248.	G & P	4	14	10,000	7	30,000
Providence, R. I.	267.	G	3	18	3,333	7½	33,333
Salem, Mass.	500.	—	1	15	——	15	——
Springfield, Mass.	167.	G	2	22	1,667	5	1,667
Taunton, Mass.	239.	P	3	19	3,333	6¾	33,333
Westerly, R. I.	300.	P	6	22½	2,060	7½	124,000
Woonsocket, R. I.	244.	G & P	4	21	3,333	7	10,000
Worcester, Mass.	300.	G	1	9	——	9	——
Average	291.	—	4	19⅓	23,423	7½	176,741

The most common number of rates in use seems to be three, although Fall River uses as many as fourteen. First, or high rate, is New Haven's 50 cents for the first 200 cu.ft. Low rate for quantity use varies from the Salem, Mass., single rate of 15 cents down to New Bedford's one cent for quantities over 666,600 cu.ft. per month. The analysis shows no apparent consistent relation between rates and methods of supply, that is, whether water is supplied by gravity or by pumping; however, most of the lowest rates occur in connection with gravity supplies.

Many factors enter into the establishment of rates for each individual system, in addition to the method of supply. First cost, affected heavily by geographic and other local conditions, as well as operating costs, varies a great deal even in the small area of New England, and these are reflected in rates. No schedule can be fixed, therefore, as the one correct solution for all.—ARTHUR C. KING, *superintendent, Board of Water Works, Taunton, Mass.*

Iron removal experiences

To remove iron from the ground water supply of Sanford, Maine, a zeolite type removal plant was installed. This included three pressure filters, 8 ft. in diameter by 5 ft. high. The filters had a 24 in. bed of zeolite on top of a 12 in. layer of gravel; rated capacity was 750 gpm.

The zeolite removed the iron by base exchange and was regenerated by a brine solution. While the zeolite filters satisfactorily removed the iron from the water, difficulty was experienced in trying to maintain the pH of the water at a high enough point so that the zeolite would not disintegrate. Additions of soda ash, sodium silicate and caustic soda worked fairly well for a short time but eventually they interfered with zeolite action in removing iron.

Experiments then were made, with three household size filters. One filter containing coarse sand, was used as a roughing filter. Water from this unit was divided between a filter containing manganese zeolite, and another which contained fine sand. Air was injected ahead of the sand filter to oxidize the iron in the water. The results of a year's study show that the sand filter with injection of air gave equally good results on Sanford water as either the manganese zeolite or sodium zeolite.

Accordingly, a change was made from the zeolite to the sand-air process. The zeolites and gravel were removed from the tanks and the gravel washed for reuse. The bed was made of 8 in. gravel, 10 in. coarse sand and 12 in. fine sand. In operation for over a year, this process has given satisfactory results. Recent examination of the filter sand shows that it is heavily coated with iron. Water leaving the filters has practically a zero iron content.—HORACE L. CLARK, *general manager, Sanford, Maine, Water District.*

Water control in New Hampshire

Conservation of water for river regulation was the main purpose for which a Water Resources Board was created in New Hampshire in 1935. In setting up the board, the legislature sought to make feasible the construction of additional reservoirs by the use of state credit for financing and the elimination of taxes on all improvements. No direct appropriation was made, which could be used for such construction, since it was believed that reduction in annual cost due to the use of state credit and tax elimination would make the creation of projects economically feasible and attractive to water users downstream. Such users would then be expected to enter into contracts with the board to annually pay to the board for the use of water an amount of money sufficient to pay the cost of the project.

One such project, the Pittsburg reservoir (now called Lake Francis) on the upper Connecticut River, has been completed under this arrangement. Costing about $2,300,000, it was financed by a bond issue of the board to be amortized over a 50-year period. Downstream water users have entered into a 50-year contract with the board which calls for annual payments, the aggregate amount sufficient to meet debt service, operation and maintenance, and a portion of administrative expenses of the board. At the end of the 50-year period the contract will expire and the state of New Hampshire will then own the reservoir without debt or obligation and the reservoir can be used for whatever purpose there appears to be in the best public interest.—RICHARD S. HOLMGREN, *chief engineer, New Hampshire Water Resources Board and Water Control Commission, Concord, N. H.*

Public relations pictures

Two motion pictures designed to promote public relations and understanding of water purification were exhibited in the technical session and offered for free use to water department officials. Showing of these pictures was recommended as particularly helpful at this time when sabotage precautions prohibit visits to water plants and thus curtail public interest in this municipal service.

One of the films, a sound picture available in both 16 and 35 mm. sizes, shows the close relationship between water purification and sewage treatment in maintaining community health. Designed primarily for the layman, the picture includes animated diagrams which depict the function and operation of various units in both water and sewage treatment processes. Information concerning the availability of the film may be obtained from Thomas F. Wolfe, research engineer, the Cast Iron Pipe Research Association, 1015 Peoples Gas Building, Chicago, Ill.

The other film, a 16 mm. color production titled "Behind the Water Tap", deals exclusively with water purification. It tells the story of what is done at a treatment plant to produce pure and palatable water. Application for borrowing this film should be made to Industrial Chemical Sales Division, West Virginia Pulp & Paper Co., 230 Park Ave., New York City.

Water use survey

In a discussion on water consumption, Roger W. Esty, superintendent of the Danvers (Mass.) Water Works, reported these facts from a careful study of service connections to 120 homes of middle-income families: There were 156 families, totalling 506 people, served by these connections; 660 cu. ft. of water was the average consumption for each service; and per capita consumption per day averaged 4.29 cu.ft. Mr. Esty stated that 5 cu.ft., therefore, was ample allowance in estimating per capita use.

Requirements for Artificial Drainage at Highway Grade Separations

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***Contents in Brief**—From fifteen years of experience in providing artificial drainage for highway underpasses, the Illinois Division of Highways has evolved certain basic principles of design that insure efficient operation, low maintenance and low annual cost for such structures. These principles are outlined and typical drainage structure with pumping plant is shown.*

PROPER DRAINAGE OF UNDERPASSES at highway-railway grade separations frequently makes it necessary to resort to the use of sumps to collect rainfall and the installation of pumps to remove the accumulated water. As these pumping plants must be automatic in operation and generally are remote from skilled mechanical or electrical supervision, they must be designed for positive and dependable operation under all normal conditions, must be as simple as possible and at the same time should have low maintenance and operating costs.

Today Illinois has 45 separations where pumps are installed. These were built over a period of 15 years during which time designs changed with experience until the design now generally applied was evolved. That design and some of the basic principles that are applied are described in the following article. Mechanical and electrical details given herein should be considered only as typical because these details for each installation need to be worked out by competent mechanical or electrical engineers. Highway engineers usually are not qualified in mechanical or electrical engineering and so make mistakes in trying to solve problems outside of their field. They make a further mistake if they allow pump manufacturers to design and specify the type of equipment for a particular job, which is wrong in principle, regardless of the best and most honest intentions of the engineer and manufacturer.

Maintenance and first cost

Many stations are located in rural areas remote from experienced mechanics where ordinary maintenance must be done by patrolmen who do general highway maintenance work. Special attention, therefore, must be given to providing a plant so simple and rugged that it will give dependable service under such conditions. It also must be so designed as to facilitate inspection and servicing of all mechanical and electrical parts by mechanics assigned to that work. Reg-

Highway underpass at Chicago, where lack of natural drainage made necessary the installation of a pumping plant.

ularity of such checking is important as failure of the equipment will allow water to collect on the pavement and tie up traffic on important routes. Patrolmen should check the pumps at least twice each week to see that they operate, and twice each year an engineer should check the equipment to see what repairs or replacements are needed.

First cost of the equipment should not be the guiding factor in the design. The saving of a few dollars may be completely disregarded, because the cost of the pumping station and its equipment is a small percentage of the total cost of the grade separation. The equipment for the pumping station must be designed so that it will function entirely automatically, will require the minimum of maintenance, and will be protected from damage in case of failure to operate. In locations where power failures are frequent and immediate repairs are not likely to be made by the public service company, the pumps should be driven by a gasoline motor, or one pump may be driven by an electric motor and the other by a gasoline motor.

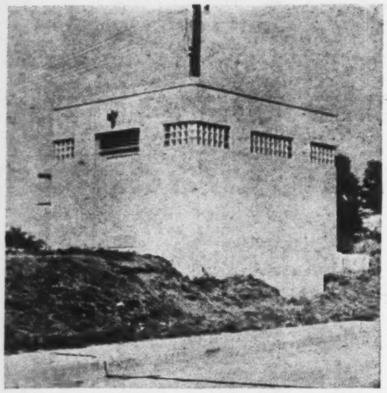
Progress in design

The first pumping station was built by the State of Illinois approximately fifteen years ago. It consisted of a single motor-driven pump installed in a wet pit and was located in an area where power failures were frequent. Several similar designs followed, until in 1933 a complete change was made in design policy.

All pumping stations are now designed for two pumping units, each having a capacity great enough to take the entire drainage. The pumps are installed in a dry pit, which is entirely cut off from the wet pit. Equipment which may be damaged by flooding is placed above the elevation of high water.

Amount of water to be handled

The first problem that confronts the design engineer is to determine the amount of water which the pumps will be required to handle. The "rational method" of computing runoff is used in Illinois, the formula being $Q = AIR$ where Q = rate of runoff in cubic feet per second, A = area to be drained in acres, which is determined by a survey, I = percentage of imperviousness of the area, R = maximum average rate of rainfall over the entire area, in inches per hour, which may occur during the time of concentration.



Panels of glass blocks placed high in the pumphouses are now used instead of windows to reduce the risk of damage through vandalism.

To determine the percentage of imperviousness, the area drained is divided into three classifications: paved area, sloping embankments and flat sodded areas. The paved area p is considered to be 90 percent, the slopes s 50 percent, and the flat areas f 15 percent impervious, so that

$$I = \frac{.90p + .50s + .15f}{p + s + f}$$

The maximum average rate of rainfall R is obtained from the Talbot formula

$$R = \frac{105}{t + 15}$$

This is the formula for ordinary storms in the eastern United States, where t is the time of concentration.

The time of concentration is usually taken as 20 min. so that R = 3 in. per hour. This may seem somewhat arbitrary, but is a fairly good estimate and can be changed where conditions vary greatly from the average usually encountered. The determination of runoff involves the judgment and experience of the designer.

Drainage system

Once the total amount of water to be handled has been determined, drains adequate to carry it to the sumps must be provided. In some locations, to lower the groundwater and to check heaving due to frost, a herringbone system of drains must be placed in the depressed area. It also must have a fall to the sump.

It might also be noted that it sometimes is desirable to remove soil of high capillarity from under the pavement, replacing it with porous material.

The sump should be designed to have a capacity of four to six times the rated capacity of the pump (usually 1,500 to 3,000 gpm.) or from 12,000 to 24,000 gal. Its area should be such that the head variation does not exceed 8 to 10 ft. The sump should be entirely cut off from the space where the pumps and motors are to be located. Ventilation is best provided through a manhole and the inlets.

Traps should be built into the inlet drains to intercept as much trash as possible, but usually it will be necessary to clean the sumps once a year.

Sloping the floor of the sump toward the pump inlet helps little in removing the mud and complicates both construction and cleaning. Level floors, therefore, are preferable.

Pumps and motors

Pumps used in the stations now being built range in size from 6 to 12 in. and are vertical, non-clog, enclosed impeller, centrifugal type. They are connected to the motors, which are located at a higher elevation, by flexible shafts with guide bearings located every five to six feet. The pumps are set to have a positive head on them at all times, thus eliminating the priming problem. Both pump casings and suction elbows are equipped with clean-out hand holes, and a gate valve is installed on the suction line to permit repairs to the pump without the necessity of sandbagging the inlet.

The power required to operate the pumps can be reduced by cutting down the friction head, which means larger pipe. Such pipe cost a little more but the saving in operating costs justifies the increase. Check valves are omitted as unnecessary and troublesome. Pump discharge is emptied into a discharge box so placed that water can flow by gravity to its ultimate outlet. Flanged cast iron pipe (Class A, A.W.W.A.) and 125-lb. fittings are used except for the float pipe, which is 8 in. wrought iron.

Motors should be drip-proof, the type depending on the character of available power. Wherever conditions will permit, line-start motors are used because the controls are more simple and easily maintained. It is sometimes necessary to use wound-rotor motors and secondary resistor type starters because the public service company does not have sufficient back-up capacity to prevent excessive dips in voltage that would be present if line-start motors were used. At other sites, squirrel-cage low-starting-current induction-type motors, with either primary resistance or auto-transformer-type starters are used.

All bearings are ball type, grease lubricated. Motor bearings are of the "cartridge type" grease packed, which require very little attention by the patrolmen when used in this type of service. The tendency for men not familiar with motors is to over-grease, with resultant damage to windings. All points requiring lubrication are made easily accessible, so that they will not be passed by because of being difficult to reach.

All installations are designed for 230-v., 3-phase operation, because higher voltages are not considered satisfactory from a safety viewpoint for the maintenance patrolmen, who are required to visit the station frequently.

Operation of the pumps is controlled by floats, the controls being so arranged that the pumps alternate their starting cycle. The pump acting as the stand-by is available for emergency service.

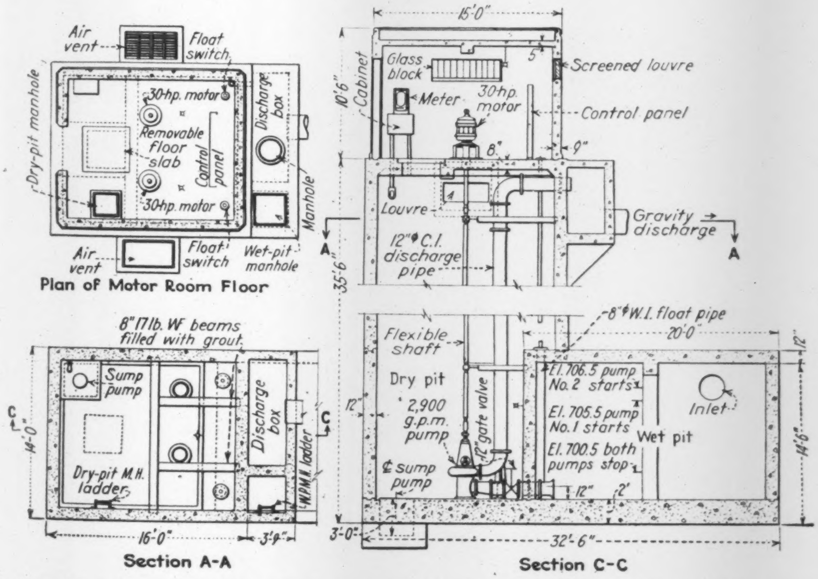
In places where electric service is not available, or where available but of insufficient capacity, or where the pumps frequently are interrupted by electrical storms, at least one pump is driven by a gasoline engine. Units of this type are operated automatically with satisfactory success. The control system is equipped with over-temperature and low-oil-pressure cut-outs, so that serious damage will not be done should the unit operate for long periods without attention.

All electric switches and control equipment are mounted on a steel control panel. Cabinets are made of heavy-gage sheet steel, either galvanized or cadmium treated. All copper parts are cadmium coated. Type A safety switches are used. Starters are equipped with low-voltage release and thermal-overload and phase-failure protection.

A small capacity pump is located in a sump in the dry pit to remove water resulting from packing-gland leakage or other causes. This pump can also be arranged to remove water from the sump which remains after the pumps have broken suction at times when the sump is to be cleaned.

Cost of operation

The cost of operation is largely dependent upon the minimum charged by the Public Utility Company for electricity. In most cases this is 50¢ per month per horsepower of connected load. There are very few locations where the motors operate sufficiently to use more than the minimum except in very wettest seasons.


Air vent
Float switch
30-hp. motor
Removable floor slab
Control panel
Discharge box
Dry-pit manhole
30-hp. motor
Manhole
Air vent
Float switch
Wet-pit manhole
8" 17 lb. WF beams filled with grout
Sump pump
Discharge box
C
C
14'-0"
Dry-pit M.H. ladder
W.P.M.H. ladder
16'-0"
3'-9"
15'-0"
10'6"
Cabinet
Glass block
5"
Screened louvre
Meter
30-hp. motor
Control panel
8"
9"
Louvre
Gravity discharge
A
A
12"ϕ C.I. discharge pipe
35'-6"
-8"ϕ W.I. float pipe
20'-0"
12"
Flexible shaft
Dry pit
12"
2,900 g.p.m. pump
12" gate valve
℄ sump pump
El. 706.5 pump No. 2 starts
El. 705.5 pump No. 1 starts
El. 700.5 both pumps stop
Wet pit
Inlet
14'-6"
12"
2'
3'-0"
32'-6"

Plan of Motor Room Floor

Section A-A

Section C-C

Details of the pumping plant for an underpass now under construction at Warrenhurst, which is typical of the plants now used in Illinois. A periodic maintenance inspection of the pumping station and equipment by a qualified engineer has been responsible for a decrease in total equipment failures.

The structures housing the pumps and control equipment should be so located that maintenance trucks when at the building will be off the main highway. Also, the architectural treatment should be in harmony with other structures of the grade elimination. Windows should be eliminated due to the risks of vandalism, panels of glass block being substituted. Louvered openings should be used for ventilation, screened to keep out birds and insects. In cold climates provision should be made for closing the louvers into the dry pit during very cold weather to keep the pumps from freezing.

Insulating the roof will reduce condensation and the dripping of water on electrical equipment.

The motor room and dry pit should be equipped with electric lights so that maintenance men will have every inducement to do their work well. Facilities for easy removal of equipment from the building are a great help when extensive repairs are needed. These should include heavy eye-bolts over each motor and over the removable floor slab in the motor room.

Structural design of building

In the structural design of the building here illustrated advantage was taken of the conditions of continuity, and stress analyses was made using the Hardy Cross method. Vertical walls are designed to resist bending moment combined with axial thrust as well as shear due to lateral loads.

The top and bottom slabs are designed for bending moments and for shears due to vertical loads or reactions. Spans are assumed as center to center of walls, and slabs are reinforced in two directions. The load is considered as being distributed in proportion to the relative rigidities of the spans.

The structures described herein were built by the Division of Highway of the Illinois Department of Public Work and Buildings, Walter A. Rosenfield, director, Ernst Lieberman, chief highway engineer. The resignation of Mr. Lieberman as chief highway engineer became effective on Oct. 1. M. J. Fleming, assistant chief highway engineer, has been named acting chief highway engineer until such time as a successor to Mr. Lieberman's position is appointed.

Effective Lift of Dredge Pumps Tested by Corps of Engineers

***Contents in Brief*—Tests on two dredge pumps, one a 30-in. typical hopper-dredge set up, indicate effective dredging to be impossible with suction lifts as high as 16 ft. Low velocity, few solids, intermittent discharge, broken vacuum and frequent repriming characterize the high lift.**

A SUCTION LIFT of 16-ft. is above the limit at which hopper dredge pumps will operate effectively according to tests made by the Corps of Engineers. The first tests were made at Fort Mifflin on the Delaware River with a 6-in. pump and suction; for the second test at Natchez Island on the lower Mississippi a pump with a 30-in. suction and discharge line was used.

In both tests the suction loop was arranged so that the lift could be made 16 ft., 10 ft. or 7 ft. by removing sections of pipe. All necessary gages and priming and measuring devices were installed in both tests. The average results obtained in the two tests are given in the accompanying tables.

Fort Mifflin tests

The 6-in. sand pump used at Fort Mifflin was operated by a 7x7-in. single-cylinder vertical steam engine. It was set 4 ft. 4 in. above the water line and the suction line was 114 ft. long. Table 1 shows the average results of the tests.

The tests showed that while pumping water alone through the 16-ft. loop the vacuum required at the top of the loop was 27 in. although the velocity was only 10.7 ft. per sec. The discharge was satisfactory during all water pumping tests. During the majority of tests when pumping mud or sand with the suction loop 16 ft. above the water surface the discharge was intermittent and the vacuum broke, necessitating raising the suction end off the bottom and repriming the pump. The percentage of mud pumped with this high lift was so low and the velocity so slow that efficient dredging could not be expected.

While pumping material the vacuum was difficult to maintain when the loop was 10 ft. above the water surface. The suction vacuum at the top of the loop was high when pumping water, varying from 24 to 27 in. When pumping mud the percentage of material was extremely low. During two of these tests, while pumping heavy material with a vacuum of 27.5 in., the discharge was intermittent and the vacuum broke. Results were somewhat better with the suction loop 7 ft. above the surface of the water. The pump maintained its suction and velocity satisfactorily although the percentage of solids was low.

Natchez Island tests

Three tests were run, using a 30x120x7-ft. pump barge on which is mounted a water tube boiler operating at a pressure of 200 lb. per sq. in. and a 16x22½x40x20-in. triple expansion vertical marine engine directly connected to a pump having a 30-in. suction and a 30-in. discharge. The center of trunnion is 5 ft. above the water surface and the centerline of the pump is 1 ft. 4 in. above the surface of the water. The length of the suction pipe from the centerline of the drag lift to the suction end was 107 ft.; the length of 30-in. discharge was 150 ft. and with a nozzle added to reduce the discharge to 26½ in. was 162 ft. overall. The centerline of the discharge pipe was 10 ft. 3 in. above the centerline of the pump. Suction pipe was lowered during the test runs to a digging range of 34 to 60 ft. below waterline.

The average of the data secured have been incorporated in Table II. More time was given to the 16-ft. lift, than to the alternate lifts of 10 ft. and 7 ft. The outstanding facts indicated when pumping through the 16-ft. suction lift are as follows:

(a) With a vacuum of 29¼ in. required at the top of the loop when dredging at a depth of 56 ft. the velocity was 12.5 ft. per sec. and the percentage of solids was 7 percent. With a vacuum of 27½ in. required at the top of the loop when pumping water at a depth of 23 ft. the velocity was 15.8 ft. per sec.

(b) The pump was primed without serious loss of time or difficulty using the customary ejector after the pump had been filled with water. The operation of the pump was normal without loss of prime.

(c) The average percentage of material, the result of numerous samplings, appears to be in excess of the amount which would normally be expected from the vacuum available for handling material. This may be due to the siphoning effect of the suction pipe arrangement and is possibly responsible for the reasonably high percentage of solids secured in this test. The percentage of solids increases, of course, as the lift decreases. The results of the tests do not justify the use of a suction of the extreme height of 16 ft.

TABLE I—AVERAGE RESULTS OF FORT MIFFLIN TESTS OF 6-IN. DREDGE PUMP WITH SUCTION LIFTS OF 16 FT., 10 FT. AND 7 FT.

Suction Loop Centerline above water	7-Ft. Lift		10-Ft. Lift		16-Ft. Lift	
Pumping	Water	Mat'l	Water	Mat'l	Water	Mat'l
Vacuum in inches — top of suction loop	23.8	23.5	25.3	26.1	26.8	20.8
Pump suction in inches	23.8	21.2	22.7	21.9	19.7	13.1
Pump discharge pressure, lbs. per sq. in	0.85	0.84	0.87	0.75	0.5	0.5
Dischargeline velocity in ft. per sec	13.5	10.5	12.8	10.7	10.5	8.1
Percent solids *	....	9.42	....	4.3	....	7.5
RPM. of engine	379	376	382	386	384	462
Depth of suction in ft	40	47	40	51	40	45.5

* Material assumed to weigh 90 lbs. per cu. ft.

TABLE II—AVERAGE RESULTS OF NATCHEZ ISLAND TESTS OF 30-IN. DREDGE PUMP WITH SUCTION LIFTS OF 16 FT., 10 FT. AND 7 FT.

Centerline suction above water	7-Ft. Lift		10-Ft. Lift				16-Ft. Lift			
	30" Disc. pipe		30" Disc. pipe		26¼" Disc. pipe		30" Disc. pipe		26¼" Disc. pipe	
Pumping	No water test made	Mat'l	Water	Mt'l	Water	Mat'l	Water	Mat'l	Water	Mat'l
Vacuum, in. top of suction loop		21.8	22.0	25.1	22.0	25.7	27.5	28.4	27.5	28.7
Pump disc. in lb. per sq. in.		0	2.0	2.0	6.0	3.3	2.0	1.0	3.2	1.9
Disc. line vel. in ft. per sec		9.7	16.3	9.6	30.0	16.3	10.1	7.7	18.2	12.1
Per cent solids		17.6	0	16.4	0	14.8	0	7.4	0	8.6
HP. of engine		854.9	923.3	907.7	800.7	931.4	789.2	728.1	796.6	750.3
RPM. of engine		190.8	180.0	183.0	167.5	186.7	175.0	171.6	175.0	178.0
Steam pressure at throttle		197.2	209.0	202.9	195.0	202.9	200.0	202.2	206.8	202.7
Depth of suction in ft		51.4	15.7	58.0	33.9	60.8	23.0	53.4	19.3	55.3

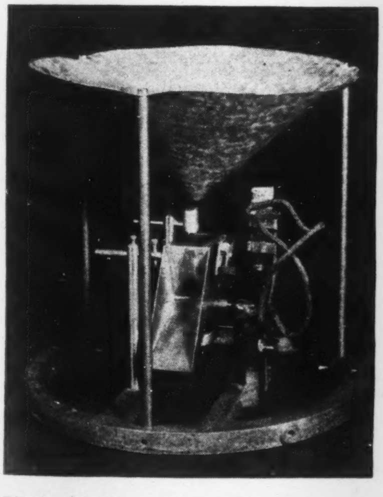
Recording Rainfall Gage Designed For Remote Mountain Station

Walter J. Wood
Assistant Chief Hydraulic Engineer
Los Angeles County Flood Control District

***Contents in Brief**—Loss of observer at key station causes Los Angeles County Flood Control District to build and install a recorder of special type. Impulses actuated by tilting bucket unit transmitted 12 miles to integration type instrument designed to insure record of high-intensity precipitation. Used in connection with operation of Big Tujunga Dam.*

A Recording Rainfall Gage of integrating type has been established by the Los Angeles Flood Control District in Big Tujunga Canyon because the observer moved away from a key-station that had a 44-year record considered essential in operating Big Tujunga Dam during periods of storm. The tilting-type receiver is connected by 12-mile circuit to an integrating recorder, which registers in 0.02-in. units with a cam movement that allows any number of reversals during a storm of high intensity.

Rainfall records in the Sierra Madre Mountains near Los Angeles are of considerable importance to the district and other cooperating agencies. The number of possible rainfall stations is rather limited due to the scattered location of camps and to the few permanent resident observers available. Usually when an observer moves out it is necessary to abandon the station. However, when this happened at Sleepy Hollow Ranch (formerly Colby's Ranch) in the Big Tujunga Canyon, it was deemed necessary to continue the record by some means, for two reasons: (1) the station had the longest continuous record of any mountain station in the county, having been established in November, 1897 (automatic since 1926); and (2) rainfall information during storms is necessary to assist in the operation of Big Tujunga Dam, this station being located so that its rain data were nearly average for the watershed above the dam.

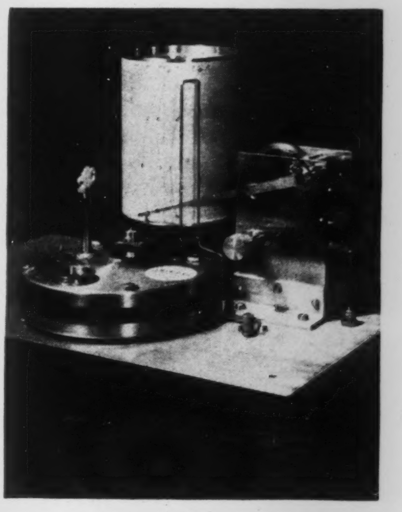


Tipping bucket receiver mounted inside regulation raingage has a capacity of 0.02 in. per tip. A mesh screen over the funnel prevents clogging of the outlet. The mercoid switch operates the circuit to the recorder 12 miles distant.

Final plans called for a receiver of the tipping bucket type to be located at Sleepy Hollow Ranch, connected by telephone lines to a recording device located at Opid's Camp, near Mt. Wilson. Sleepy Hollow is practically inaccessible during the storm season due to its isolated location, while Opid's Camp is usually accessible by road, can be contacted on each of three telephone lines, and has several people resident throughout the year. As Opid's Camp is a key rainfall station of the district, and reports frequently throughout every storm, it was an ideal recording terminal for the Sleepy Hollow raingage installation.

The tipping bucket unit installed Feb. 14, 1941 (see illustration), has a capacity of 0.02 in. rain per tip. The unit shown is mounted inside a standard type raingage, near the bottom. The funnel edges are soldered to the inside of the raingage can, with a removable mesh screen, 8 in. in diameter, inserted over the funnel to prevent clogging of the funnel outlet by leaves, etc. Collection of snow in the 8-in. container above the funnel presents an occasional problem and results in a delayed and inaccurate intensity record until the snow catch is melted.

The electrical circuit selected for use at the receiving end utilizes 27 volts obtained from dry cells. Two permanent magnets are mounted on the bucket and, as it tips, one of the magnets comes to rest opposite a normally closed mercoid switch, thus opening the circuit. The interval be-



Designed by the district, this recorder is of the integrating type using a chart with graduations of 0.02 in. of rain corresponding to the tips of the bucket at the receiver shown at the left.

between opening and closing of the switch circuit sends current through a relay and over the telephone line. An electric counter records the number of bucket tips as a check against the recorded number at the other end of the circuit. The relay is used to close the battery circuit to the line and to the counter since the circuit is normally open.

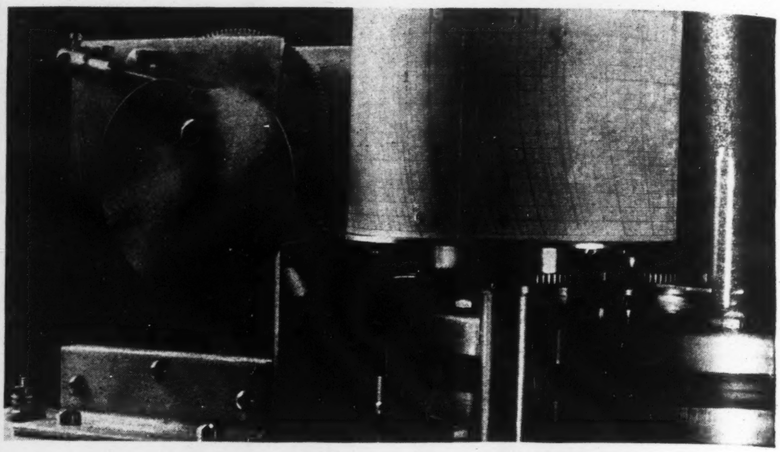
One side of the circuit is connected to ground and the other side to the center tap of one winding of a repeating coil across the telephone line. This forms the common simplex phantom circuit on an existing telephone system without disrupting normal use of the telephone line.

The 12-mile transmission line

From Sleepy Hollow the U. S. Forest Service telephone line traverses the mountains to Waterman's Ranger Station, near which it is crossed by a district-owned line that ties in to Opid's Camp. By means of an extended simplex circuit and additional repeating coils, the signal from the raingage at Sleepy Hollow is transferred from one line to another at Waterman's Ranger Station and sent to Opid's Camp, a total distance of about 12 miles.

At Opid's Camp the center of one winding of a repeating coil is tapped and a lead carried to a relay at the recorder unit. A mercoid switch, normally open, an oil dashpot or damping relay to delay closing of the switch and 6 volts of dry cells are connected in this circuit through the field coil of a stepping relay that is perhaps the heart of the recording unit.

Before discussing details of the recorder, it may be well to state that several makes of commercial recorders were investigated before the district designed its own. One type that has operated satisfactorily for the California Range and Experiment Station, previously mentioned, could not be obtained with less than five pens, whereas we needed only one, at present. This type was not entirely satisfactory for our needs because the record consists of a short vertical "kick" of the pen off the normal straight line trace for each tip of the bucket. It is therefore necessary to count the number of "kicks" during the period of time desired, to find the amount of rainfall. This feature was considered undesirable for a location subject to high intensities of rainfall, as the record might have the recorded tips so close together as to be almost impossible to count. Further, the district prefers automatic rainfall records of the integration type, having become accustomed to makes of gages furnishing this type of record. The designed recorder which we built furnishes this integration type of record.



Actuated by the cam, the recording pen rises in 0.02-in. steps to the top of the chart representing 3.00 in. of rain, and then makes a return downward traverse corresponding to another 3 in. This system permits an unlimited record.

How the recorder works

As built, the recorder (see illustrations) has a chart drum rotated by a spring-driven 8-day clock once each 24 hr. The chart used was purchased from the Julien P. Friez Co. for use on the Ferguson type 9-in. capacity gage, of which type the district has 31. This chart was selected because it has depth graduations of .02 in. of rain, corresponding to the amount of each tip of the bucket in the receiver.

As the impulse from each tip of the bucket comes through the circuit it actuates the stepping relay of the recorder, and this movement, through gearing, causes rotation of the heart-shaped cam (see illustration), which motion is translated to the pen arm by an L-shaped follower attached to the pen arm. The pen rises in steps of .02 in. until it reaches the top of the chart which represents 3.00 in. of rainfall; it then starts a downward traverse of 3.00 in. The number of possible traverses is unlimited as a result of the use of the cam.

No rain is collected at the receiving or raingage end, but is wasted with each tip of the bucket. Therefore, an entire season's record without attention is possible, assuming that batteries, etc., do not fail. The clock must of course be wound and charts changed, at the recording end.

Some trouble has been experienced this season from lightning, which has burned out several repeating coils. Several peculiarities in the chart record have also been ascribed to lightning surges in the lines. Adjustment of the action of the damping relay, previously mentioned, is believed to have practically eliminated this source of trouble.

A standard raingage is maintained at Sleepy Hollow as a check on the total amount of rain recorded. While this gage cannot be read frequently, it will hold nearly 24 in. of rain. Evaporation is reduced by the addition of a small quantity of kerosene to form a film over the water surface.

On the whole the records have proven satisfactory and, although some experimental work will still be necessary to remove certain troubles, it is felt that the primary purpose has been achieved.

H. E. Hedger is chief engineer of the Los Angeles County Flood Control District. The work described in this article was done under the general direction of Paul Baumann, senior assistant chief engineer and Finley B. Laverty, chief hydraulic engineer, and under the immediate supervision of the writer. Credit for design and construction of the equipment is due John V. Frederick and F. H. Mellen. M. E. Kennedy was responsible for installing all telephone line connections and assisted on the installation.

An Engineer's Approach to Fluid Mechanics

Arthur Ellwood
Assistant Engineer-Designer, Board of Water Supply, New York

***Contents in Brief**—Vast strides forward have been made in the development and application of mathematical analysis for the solution of practical hydraulic problems. The following discussion reviews some of these new concepts and points to the significance of various formulas of the modern school of fluid mechanics. An illustrative example shows the application of these formulas to the practical problems of engineers.*

MODERN HYDRAULICS has an historical background that can be divided into three distinct phases, the first of which had its beginnings in the latter part of the 19th century. At that time two schools of thought were active, one of which was concerned with hydrodynamics, and the other involved in what we might call "empirical hydraulics."

Hydrodynamics was an abstract mathematical study, the equations of which could not be used by the engineer to solve his everyday problems. Thus it was inevitable that a search should have been made for practical formulas by which the flow of water could be determined in pipes and channels of various shapes and materials. Certain basic relationships, such as stated by Chezy's formula, had been established; but constants—depending on the lining friction and other factors—were lacking. Thus began a period of empiricism with one investigator after another bringing to the engineering profession many "constants." These formulas and constants still are our tools in designing waterworks, sewer lines and other hydraulic structures.

Second phase of development

The second phase in the development of hydraulic science came after the publication and interpretation of the work of Osborne Reynolds (1883). There was present the desire to coordinate and correlate all the various experiments and constants in order to determine if one general constant could be found, which would apply for different types of pipes under various flow conditions.

The general equation for flow in a pipe is

$$S = \frac{f}{4R} \cdot \frac{U^2}{2g} \quad \ldots\ldots (1)$$

where f, the friction coefficient, is a pure number and is valid for all systems of dimensions. Hydraulic investigators have correlated all available data on pipes and have plotted on a logarithmic scale the factor f against Reynolds number **R**.

$$\text{where } \mathbf{R} = \frac{UD}{\nu} \quad \ldots\ldots (2)$$

$U =$ mean velocity
$D =$ diameter

$\nu =$ kinematic viscosity $= \frac{\mu}{\rho}$

Through the work of Blasius and Nikuradze definite values of f were obtained for certain limits of Reynolds number. Thus for laminar flow (or up to $\mathbf{R} =$ approximately 2,000)

$$f = \frac{64}{\mathbf{R}} \quad \ldots\ldots (3)$$

For turbulent flow in smooth pipes from $\mathbf{R} =$ approximately 2,000 to approximately 100,000 Blasius determined, in 1912, that

$$f = \frac{0.3164}{\mathbf{R}^{1/4}} \quad \ldots\ldots (4)$$

In 1932 Nikuradze proposed for smooth pipes, when values of $\mathbf{R} =$ approximately 100,000 to $\mathbf{R} =$ approximately 10,000,000, that

$$f = 0.0032 + \frac{0.221}{\mathbf{R}^{0.237}} \quad \ldots\ldots (5)$$

The third phase of hydraulic investigation, the one in which we of the present era participate, introduced the concept of "fluid turbulence." The internal mechanism of the flow of fluids has been studied both qualitatively and quantitatively and this has resulted in the development of general equations for velocity distribution curves and boundary resistance equations.

The following discussion will deal primarily with a review of some of these new concepts developed by the Prandtl-von Kármán school. No mathematical derivations will be given, since these can be found in the references. The main attempt is to portray the physical significance of the various formulas of the modern "fluid mechanics" school. Many of the diagrams and symbols in this presentation follow those used by Prof. B. A. Bakhmeteff in his book.

Velocity distribution curves

Engineers and hydraulicians have known for many decades that the velocity in a pipe flowing full is not constant, but varies from a minimum at the wall surface to a maximum at the center. The velocity distribution curve obtained from a 48-in. pipe in service in New York City is shown in Fig. 1.

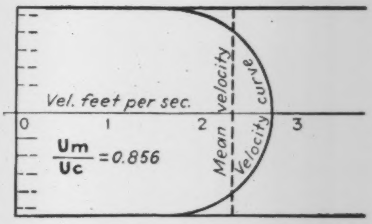


Fig. 1. Velocity distribution curve in a 48 in. pipe—Convent Ave. and 127th St., New York City.

The velocity obtained from the expression $U = Q/A$ is only the "mean velocity," which may be 10 to 20 percent less than the maximum velocity. Thus the use of the velocity head $U^2/2g$ in Bernouillis' equation is not quite correct and for precise work certain factors α or β must be applied as corrections. Considering the kinetic energy passing any section it has been shown that

$$a = \frac{\int_0^A U^3 dA}{U_m^3 A} \therefore h_v = a\frac{U_m^2}{2g} \ldots\ldots\ldots (6)$$

Considering the momentum per second at a certain section

$$\beta = \frac{\int_0^A U^2 dA}{U_m^2 A} \therefore h_v = \beta\frac{U_m^2}{2g} \ldots\ldots\ldots (7)$$

One of the aims of modern hydraulicians has been to find the mathematical equation of the velocity distribution of a fluid in a conduit. This problem, as we shall see later, has been successfully solved by Th. von Kármán.

Laminar flow

It was Isaac Newton who first expressed in *Principia* (1687) the law and the equation for the tangential stress in laminar flow. Newton pointed out that if a fluid layer moves with a velocity U with respect to another layer which is a distance y away, the velocity distribution is triangular and that the shearing stress in a fluid in motion is:

$$\tau = \mu\frac{dU}{dy} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (8)$$

where μ is the "absolute viscosity coefficient."

Hagen and Poiseuille, using Newton's hypothesis derived their well-known equation for viscous flow:

$$U\text{aver.} = -\frac{dp}{dx}\cdot\frac{do^2}{32\mu} \ldots\ldots\ldots (9)$$

where d_o = diameter

μ = absolute viscosity

$\left(\frac{dp}{dx}\right.$ = pressure gradient, or loss of pressure per unit length)

This illustrates that in laminar flow the loss-of-head varies as the first power of velocity. Poiseuille's formulas also demonstrated that in viscous flow the maximum velocity is twice the average velocity.

Turbulent flow

Turbulent flow does not follow any definite pattern; each particle undergoes constant and irregular fluctuations quite unpredictable with respect to time. Thus turbulent flow is different from "vortex" flow, since the latter follows a definite pattern (although turbulence might result from a vortex). Turbulence manifests itself in form of large and small eddies which can transfer momentum from one layer to another and can also cause dissipation of energy.

Mathematically each particle of the turbulent fluid has three instantaneous velocity vectors U, V and W in each of the three axes, as shown in Fig. 2. Each velocity fluctuates in a haphazard fashion with respect to time. Each velocity is made up of the mean velocity, $\overline{U}$, $\overline{V}$ and $\overline{W}$, and the fluctuations in their respective directions u', v' and w'. If the flow is in the direction of the X-axis, the average velocity $\overline{U}$ is constant, while the average velocities $\overline{V}=0$ and $\overline{W}=0$.

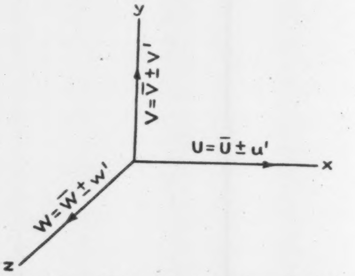


Fig. 2. Velocity vectors, U, V and W, for each particle of a turbulent fluid.

Although the action of turbulence is apparently fully disordered, a statistical distribution of turbulence shows that it follows the normal error law and frequency distribution curve. This led to the study of turbulence by the statistical method. Much has been done in that field by von Kármán, G. I. Taylor and A. A. Kalinske. The mathematics of that theory will not be presented in this discussion, and is merely mentioned here as the field where most of the present day hydraulicians expect to find the answer to what Professor Bakhmeteff calls "the baffling mystery of the behavior of water."

Momentum exchange is a factor of importance in turbulent flow and must be considered. For example, in Fig. 4, if filament (b) moves with a velocity u' with respect to filament (a) while the cross-current velocity is v', there will be an exchange of mass per unit time and thus an exchange of momentum from (b) to (a). This will result in a tangential force F_t and thus a tangential unit stress τ. It can be shown that

$$\tau = \rho . v' . u' \ldots . \text{where } \rho = \text{unit density } (10$$

The "mixing length" is another concept of the theory of turbulence. For example, in Fig. 5 the velocity distribution curve is shown with v' representing the crosswise vector of velocity. Prandtl introduced a certain parameter for the transverse distance in any region of flow, over which a small particle is carried by the turbulent mixing process (analogous to mean free path in the kinetic theory of gases). This he called the "mixing length." From Fig. 5 it can be seen that the axial component

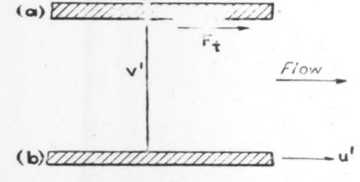


Fig. 4. Momentum exchange of turbulence introduces tangential stress.

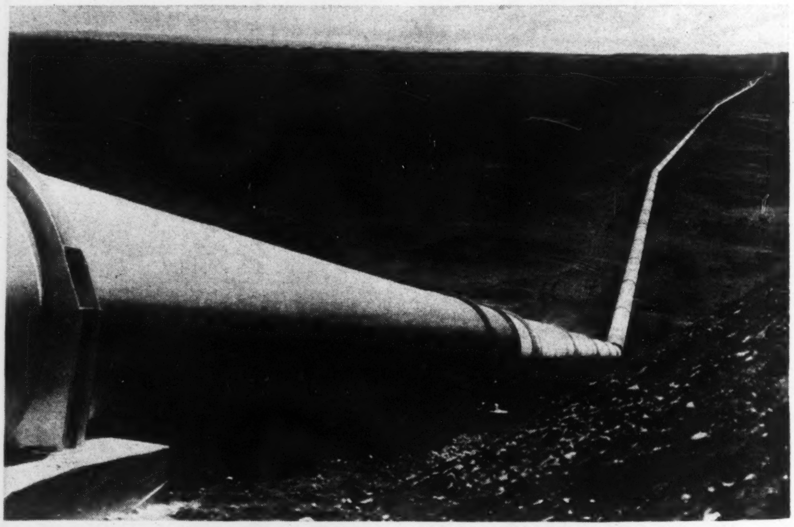


Fig. 3. Velocity distribution and turbulence of flow are factors of considerable importance in pipelines such as that for the Malheur River siphon of the Owyhee project in Oregon. This siphon, built of steel pipe 80 in. in diameter, is more than 4 miles long.

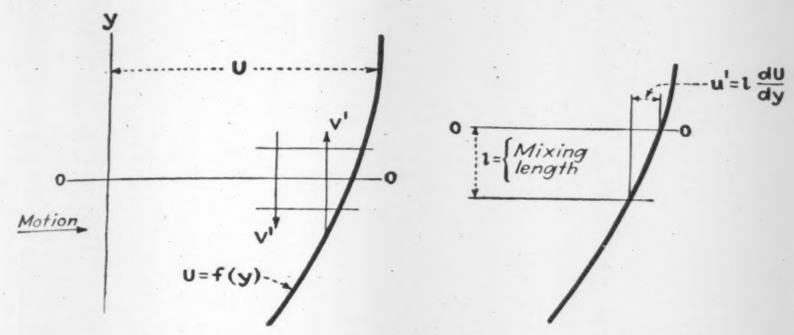


Fig. 5. Derivation diagram for determination of "mixing length" in turbulent flow.

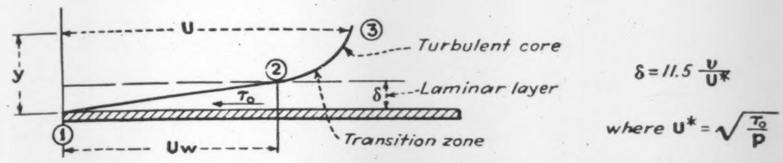


Fig. 6. Modern conception of the velocity distribution in a water conduit.

$$u' = l.\frac{dU}{dy} \qquad\qquad (11)$$

where $\frac{dU}{dy}$ is the local velocity gradient.

Assuming that on the average the components of u' and v' must be of the same order and are therefore both proportional to

$$l.\frac{dU}{dy}$$

$$\tau = \rho.v'.u' = \rho.l^2.\left(\frac{dU}{dy}\right)^2 \qquad\qquad (12)$$

or

$$\tau = \left(\rho.l^2.\frac{dU}{dy}\right).\frac{dU}{dy} = \epsilon.\frac{dU}{dy} \qquad\qquad (13)$$

This Prandtl equation is analogous to equation (8) for viscous resistance $\left(\tau = \mu\frac{dU}{dy}\right)$ The factor ϵ is sometimes called "the mechanical viscosity due to turbulence."

There was evidence from experiments of similarity of turbulence over large parts of cross-sections of any given pipe that turbulent patterns differ only in time and length scales. With certain assumptions and by means of certain principles of hydrodynamics von Kármán deduced the following relationship for the mixing length in terms of a "universal constant," κ

$$l = \kappa.\frac{\frac{dU}{dy}}{\frac{d^2U}{dy^2}} \qquad\qquad (14)$$

Here κ is von Kármán's "universal constant," which is independent of the nature of the wall surface. On the basis of Nikuradze's experiments the accepted value of κ is 0.40, (κ may actually vary from 0.32 to 0.40).

The laminar film

In actual flow of a liquid the shear is influenced by both the turbulent and viscous agents (Fig. 6). The total stress is thus a combination of equation (8) of laminar flow and equation (12) of turbulent flow.

$$\tau = \mu\frac{dU}{dy} + \rho l^2\left(\frac{dU}{dy}\right)^2 \qquad\qquad (15)$$

In the central portion of a conduit, where the mixing process has a free opportunity of action, viscosity has almost no influence on the shear. At high Reynolds numbers one can consider the flow entirely turbulent and omit the effect of viscosity in equation (15), with the stress varying as the square of the velocity. But at low Reynolds numbers the effect of viscosity is quite important and the shear will vary at a power of less than the square of the velocity.

Since at the wall surface, the solid boundary makes impossible any cross-current motions resulting in exchange of momentum, the mixing length must be zero. This eliminates the right-hand member of equation (15), leaving only the member for viscosity. Thus at the wall there must be a laminar layer.

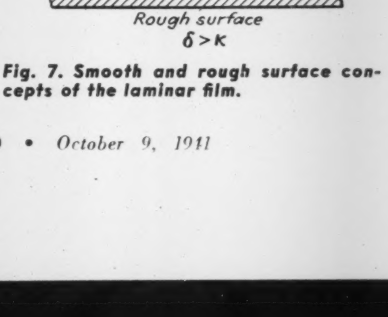


Fig. 7. Smooth and rough surface concepts of the laminar film.

The modern conception of flow in a conduit is as follows: At the boundary there is a "laminar film"; there the velocity curve distribution is linear (from 1–2 Fig. 6); above that laminar film beyond a transition zone lies the turbulent core.

The concept of laminar film gives us a physical picture of the difference between so-called "rough" and "smooth" surfaces.

If $\delta > k$ (Fig. 7) the surface is "smooth." If $\delta < k$ and the protuberances protrude into the turbulent flow the surface is "rough." Von Kármán gives the following experimentally derived value for δ

$$\delta = 11.5\frac{\nu}{\sqrt{\frac{\tau_0}{\rho}}} = 11.5\frac{\nu}{U^*} \qquad\qquad (16)$$

Since the expression $\sqrt{\frac{\tau_o}{\rho}}$ appeared frequently in his equations, Prandtl designated it as the "friction velocity." This friction velocity has the dimensions of velocity.

whereas $\tau_o = \gamma RS$

and $\rho = \frac{\gamma}{g}$

$$\sqrt{\frac{\tau_o}{\rho}} = U^* = \sqrt{RSg} \qquad\qquad (17)$$

where S = hydraulic gradient
R = hydraulic radius
g = acceleration of gravity
γ = specific weight of the fluid

Universal velocity distribution

On the basis of the above assumptions and equations, von Kármán derived his famous logarithmic "velocity distribution curve." The following equations were derived by using a simpler form of Kármán's equations as suggested by Prandtl.

Smooth Pipes

$$\frac{U}{U^*} = a_s + \frac{1}{\kappa}ln\left(\frac{y\,U^*}{\nu}\right)$$

or

$$\frac{U}{U^*} = a_s + \frac{2.30}{\kappa}\log\left(\frac{y\,U^*}{\nu}\right) \qquad\qquad (18)$$

where a_s = "surface characteristic constant."

This law has been experimentally

PURPOSE OF COMPUTATION

To find the velocity distribution curve and mean velocity for Sta. 613+15, Rondout Siphon (14'-6" tunnel) Catskill Aqueduct

DATA GIVEN

On Aug. 16, 1915, Mr. F. F. Moore, B.W.S. Designing Engineer, in order to obtain certain hydraulic elements, took flow measurements at Sta. 613+15 and, based on those results, obtained in the following data:

Diameter = **D** = 14.5'	Length = **L** = 8419'
Area = **A** = 165.13 □'	Hydraulic radius = **R** = 3.63'
Q = 468 c.f.s.	Hydraulic slope = **S** = 0.000121
Mean velocity = 2.83 ft./s	Chezy **C** = 134.98
Kutter's "**n**" = 0.01365	

ADDED ASSUMPTIONS & CRITERIA

Temperature of water = 60°F.; Kinematic viscosity = $\nu = 1.19 \times 10^{-5}$ ft.²/s

Reciprocal of Kinematic viscosity = $1/\nu$ = 84,000 s/ft.²

Reynolds number = $R = UD/\nu = 2.83 \times 14.5 \times 84{,}000 = 3{,}440{,}000$

Friction or shear velocity = $U_* = \sqrt{Rsg} = \sqrt{3.63 \times 0.000121 \times 32.2} = 0.119$ ft./s

Assume $K_S = \frac{3}{64}'' = 0.004''$

THICKNESS OF LAMINAR FILM LAYER

$\delta = 11.5 \frac{\nu}{U_*} = 11.5/84{,}000 \times 0.119 = 0.00$

$\therefore K_s > \delta : 0.004 > 0.00115$

Hence tunnel linning is a rough surface

FORMULAS USED

㉓ $U/U_* = 8.5 + 5.75 \log (Y/K_S)$ Rough surface

㉔ $\bar{U}/\bar{U}_* = 6.5 + 5.75 \log (R/K_S)$ Rough surface

COMPUTATIONS

$U = 0.119 [8.5 + 5.75 \log (Y/0.004)]$

$\bar{U} = 0.119 [6.5 + 5.75 \log (3.63/0.004)] = 2.80$ ft/s

Y (ft)	U (ft/s)	Y (ft)	U (ft/s)
0.00115	0.013	4.0	3.06
0.004	1.01	5.0	3.13
0.5	2.45	6.0	3.18
1.0	2.65	7.0	3.23
2.0	2.86	7.25	3.24
3.0	2.98	—	—

Ratio: U mean/U max = 2.80/3.24 = 0.86

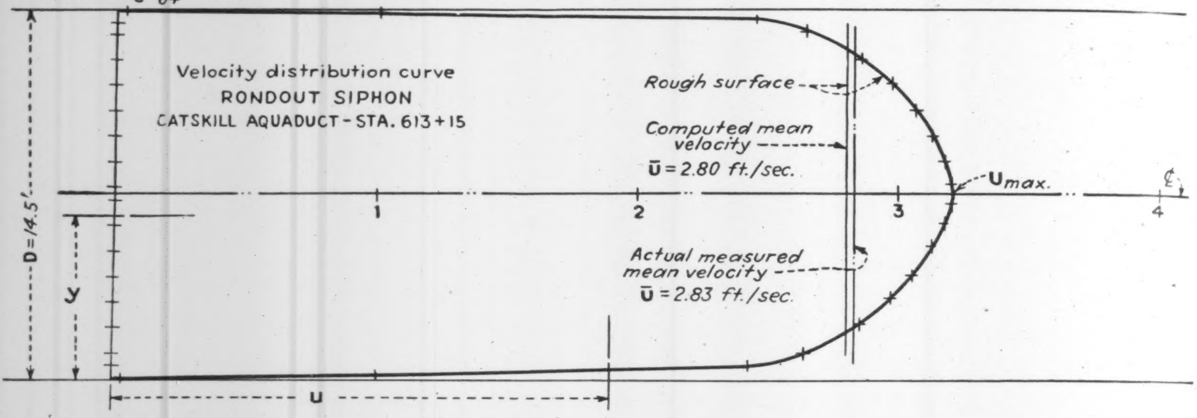


Fig. 8. Problem in applied hydraulics in which a comparison is made between results obtained by the von Karman formula for the velocity distribution and the actual measured velocity on the Rondout siphon of the Catskill Aqueduct.

verified by Nikuradze, who gave us the following equation for smooth pipes ($\kappa = 0.40$)

$$\frac{U}{U^*} = 5.5 + 5.75 \log \left(\frac{y U^*}{\nu} \right) \ldots\ldots (19)$$

The mean velocity for smooth pipes (using $\kappa = 0.36$) is

$$\frac{\bar{U}}{\bar{U}^*} = 1.43 + 5.75 \log \left(\frac{r_0 \bar{U}^*}{\nu} \right) \ldots\ldots (20)$$

or (using $\kappa = 0.40$)

$$\frac{\bar{U}}{\bar{U}^*} = 3.5 + 5.75 \log \left(\frac{R \bar{U}^*}{\nu} \right) \ldots\ldots (20a)$$

Rough Pipes

$$\frac{U}{U^*} = a_r + 5.75 \log \left(\frac{y U^*}{\nu} \right) \ldots\ldots (21)$$

Nikuradze's experiments showed (using sand-lined pipes) that

when $\frac{k_s U^*}{\nu} < 3.3$

a_r has a value of 5.5, which is the same as the value of a_s in smooth pipes.

when $\frac{k_s U^*}{\nu} > 67$

a_r is given by the expression

$$a_r = 8.5 - 5.75 \log \left(\frac{k_s U^*}{\nu} \right) \ldots\ldots (22)$$

Using these experimental values for the constants we obtain for rough pipes

$$\frac{U}{U^*} = 8.5 + 5.75 \log \left(\frac{y}{k_s} \right) \ldots\ldots (23)$$

The mean velocity for rough pipes

$$\frac{\bar{U}}{\bar{U}^*} = 6.5 + 5.75 \log \left(\frac{R}{k_s} \right) \ldots\ldots (24)$$

Energy of turbulence

In conclusion a few remarks on the dissipation of energy through turbulence. The term $\frac{W}{g} \cdot \frac{U^2}{2}$ used in elementary hydraulic text-books represents the kinetic energy of the mean velocity. The energy due to turbulence is

$$E_t = \frac{W}{g} \left(\frac{\bar{u}'^2 + \bar{v}'^2 + \bar{w}'^2}{2} \right) \ldots\ldots (25)$$

where W = weight of the fluid, and where u', v' and w' are the fluctuations from the mean velocity in the x, y and z axes. In places where the energy of turbulence varies from place to place, such as bends, valves and conduit expansions, the omission of the energy of turbulence from the calculations definitely is in error.

In turbulent flow most of the potential energy is first transferred into turbulent energy, which is then transferred into heat by the action of viscosity. If there were no viscosity there would practically be no energy loss and the energy or turbulence would persist indefinitely. A formula based on the statistical theory of turbulence given by Prof. A. A. Kalinske shows that the mean rate of dissipation of energy per unit volume of fluid is

$$K = \frac{15 \mu \bar{v}'^2}{\lambda^2} \ldots\ldots (26)$$

where λ is a length, characteristic of turbulence in energy dissipation.

Equation (26) shows that when the eddies are smaller (λ is small) the average rate of energy dissipation will be greater. Thus "to destroy the kinetic energy of high-velocity flow below a dam, it is desirable to produce intense, small-scale eddies." (Kalinske.)

The above remarks show that hydraulic engineers should become more acquainted with the modern concept of turbulence. These concepts not only give an insight to many of the mysteries of energy dissipation but might be a forerunner to a new way of calculating and designing various hydraulic structures.

In the preparation of this discussion, which formed part of an informal seminar conducted by the engineers of the New York Board of Water Supply, the author acknowledges with thanks the help given by F. H. Hapgood, J. A. Musilek, J. K. Flynn and Thomas K. Hendrick.

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Revision in California Contractors' License Law

SEVERAL IMPORTANT CHANGES have been made in the California Contractors' License Law through amendments effected by two bills passed at the 1941 legislative session and recently signed by the Governor. The changes provided in the two bills were based on suggestions made by the contractors' board and recommendations from within the industry. The amendments became effective September 13 and some of the major provisions are indicated in the following:

Under the revised law an applicant for a license who has had a license suspended for diversion of funds or failure to pay a construction obligation when having the capacity, may be required to file a bond or cash deposit to secure the license. This posting of bond does not indicate that the registrar must issue the license, and the application will be considered on the merits of the particular case. Bond may range from $250 to $1,000, and wages are given a prior claim against such a bond.

Another important change deals with classification. Under the old wording of the law the board was restricted to a narrow definition in the various classifications or divisions of the contracting business, and these definitions were written into the act. Since such definitions do not entirely comply with custom and usage within the industry, and since the registrar and board were not permitted to deviate from the classification provided by law, the new amendment will provide that various classifications can be drawn up to meet actual practice in the industry. Further, the revised law will more clearly settle the authority of the board to require a licensee to operate within the limit of his own classification, an authority which was implied by the original act but which was not clearly authorized. The board will now be able to classify groups within industry where there is a reasonable standard for classification, and will require activity of contractors to be limited to these classifications, within reasonable requirements. Permission is given, of course, for contractors to change their classification by taking examinations for any new classification, without fee.

Owners exempted

Owners of property who are building for sale will now be specifically exempted from the contractors' act, providing their construction work is being carried on by a licensed contractor. However, if the owner operates his own project by direct employment for wages, he must be licensed.

Prior to the recent amendment the act had contained no provision for giving the registrar authority to refuse licenses to applicants who had been formerly connected with organizations whose licenses had been suspended or revoked. Such refusal was assumed in the operation of the act, but was always open to court attack. This situation has been clarified by the amendment and a parallel provision makes it impossible for a person, who cannot secure a license, to purchase interest in a corporation holding a license, and become an active officer. Under the new wording of the law, corporations and partnerships are prohibited also from employing as officers, directors or responsible managing employees any person whose license is under suspension or who has been refused a license for good cause.

Another clarification is the requirement that a license cannot be issued to a minor until he has had a guardian appointed by court.

To further strengthen the act, a provision in one of the new amendments extends jurisdiction of the registrar past the time when a license is in force, making it impossible to avoid jurisdiction by surrendering a license. The registrar must accept a license when surrendered, and cancel it, but hereafter authority is extended for the purpose of disciplinary action, investigations and proceedings, even though the license ceases to be effective.

The period for renewal of a contractor's license has been reduced, by the recent amendment, from a twelve-month period to a period of 90 days, and unless licenses are renewed by September 30 of each year, contractors will be required to file new applications and take the required examination.

WPA Plans Rail Removal to Provide Scrap Steel

To aid in providing scrap steel for the defense program, the Work Projects Administration has set up a plan for assisting cities to remove abandoned street car rails from their streets where the abandoned rails have become the property of the city. The amount of such rail is estimated at 200,000 pounds.

Cities planning to take up such rails and repair the street under WPA auspices are required to agree to sell the scrap rail as directed by the OPM, the proceeds to be applied to the sponsor's share of the cost of the work. State WPA Administrators have been instructed to expedite the handling of projects of this kind.

London Letter

Replanning Bombed Cities of Britain

G. L. Pepler
Honorary Secretary and Past President
Town Planning Institute, London, England

***Contents in Brief**—Britain is doing as much looking ahead as is possible under the dynamic conditions under which she is living. There is a national post-war planning council, and cities are beginning to prepare tentative rebuilding plans. These are designed to be sufficiently detailed to permit an immediate start of work as soon as the war ceases, but are flexible enough to allow changes and enlargements to be made readily.*

THE SUBJECT OF CITY reconstruction has been before the members of the Town Planning Institute since bombing began and, at an early stage, it formed a research and planning group. The Institute has also been glad to cooperate with Lord Reith since the Autumn of 1940 when he was charged by the government with the task of working out the methods and machinery for the reconstruction of town and country after the war. In performing this task, Lord Reith was authorized to assume: (a) that there would be a central planning authority; (b) that the central planning authority would work to a national policy to be formulated in respect to transport, industrial development and agriculture; (c) that some matters would be handled nationally, some regionally and some locally.

Many large towns have suffered seriously from bombing and this has resulted in injury and loss of life, the destruction of or serious damage to property, the temporary disruption of public services such as the supply of water, electricity and gas, the disposal of sewage and the interruption of communications. Fires have to be fought, people and their belongings rescued and transferred to other premises, which have to be prepared for them; buildings and services must be patched up, unsafe structures demolished and debris removed; people must be clothed and fed, and the injured cared for.

These are some of the first jobs that have to be tackled both during and after bombing, and it speaks well for our civic authorities that, despite these urgent and pressing tasks and despite the devastation they see around them and the knowledge that there may be more to come, they are beginning to plan ahead so that good shall come out of evil.

All cities which have grown through the eras of the horse-drawn vehicle and the railway to the age of the automobile have congested, dangerous cores and many have old treasures that have become engulfed and lost to sight. It is these cores which the enemy, with complete disregard for military objectives, has bombed and, in some cases, largely destroyed. Unfortunately, this has led to loss of life and loss of many treasures, but it has cleared the way for reconstruction on lines adapted to the age of electricity, the automobile and the aeroplane, and to modern methods of building.

This is the goal which our civic authorities have before them and toward which the government may be expected to assist them. Consultations with reference to technical and other problems have been taking place for some time, and in the near future new legislation is expected to provide the machinery for control and to insure that the work of reconstruction shall not be hampered by any manipulation of site values. Also the machinery of compensation by the government for owners of property suffering war damage is designed with a view to assisting sound planning.

Since 1932, it has been possible to prepare planning schemes of reconstruction. Fears of compensation have limited the exercise of these powers but the members of the Institute have been studying the technique. They are, therefore, ready to take advantage of the new opportunity, although recognizing that there is still much to learn. To meet this need, the Council of the Institute is consulting the heads of the planning schools which it recognizes, with a view to arranging for study courses during the war and an intensive refresher course immediately hostilities cease.

Meanwhile the cities, encouraged by Lord Reith, are beginning to prepare their plans, boldly and comprehensively. A civic survey covering existing facts and tendencies and possibilities is of course an essential preliminary; fortunately such surveys had been undertaken in many towns and now only require bringing up-to-date or expansion.

It is recognized that plans prepared now can only be tentative because, unfortunately, more bombing may be expected. Also national policies respecting agriculture, location of industry and communications cannot be fully evolved until there is a clearer picture of probable post-war economics and conditions. On the other hand, as soon as war ceases there will be a demand to restore the life of our cities and to rebuild our business premises and homes, and therefore plans must be ready and sufficiently detailed to enable the work of reconstruction to begin without delay. If plans sufficient for this are available it will insure starting on sound lines and give time to plan the next steps with greater precision.

The pages of our Journal frequently refer to planning practice and developments in the United States. Also we know, for example, that you have recently developed a technique of mass-produced houses. Might the latter afford an immediate post-war use for some of our great war factories? For any assistance you can give us and our colleagues in other European countries, in considering the great problems with which we are faced, we shall be more than grateful.

BUILDING DESIGNERS' LIBRARY

Notation System for Indicating Steel in Reinforced Concrete

The Number of Different types of reinforced concrete beams in the 341x547-ft. floor area of the five-story Social Security Board Building in Washington, D. C., resulted in the development of a special system of notation for indicating the steel, which expedited office and field work. The structure was designed and built by the Public Buildings Administration of the Federal Works Agency and the beam and slab notation system was developed in the structural engineering office of that organization.

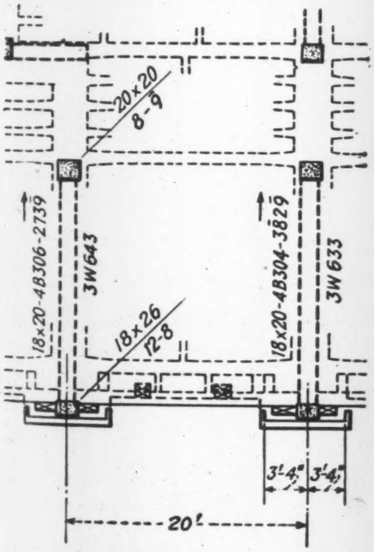
Actual design of the structural members involved usual practice, but the number of beams made feasible the use of a system of symbols on the floor plan drawings to present in condensed form all essential information as to the reinforcement, when interpreted according to a key explanation. This explanation appeared on one of the structural drawings and was quickly memorized by the field organization resulting in effective use of the new system.

As an example of the notation system, a beam (see drawing) might be marked "18x20 — 4 B306 — 2739" on the floor plan and this notation would be translated to indicate: (1) the width and depth of the beam in inches, (2) fourth floor beam number 306, (3) the number of straight bars (two) and the size of these straight bars in eighths of an inch (⅞ in.), (4) corresponding number and size of bent-up bars. An arrow over the two numbers relating to the bent-up bars shows that these bars are to be extended over adjacent spans.

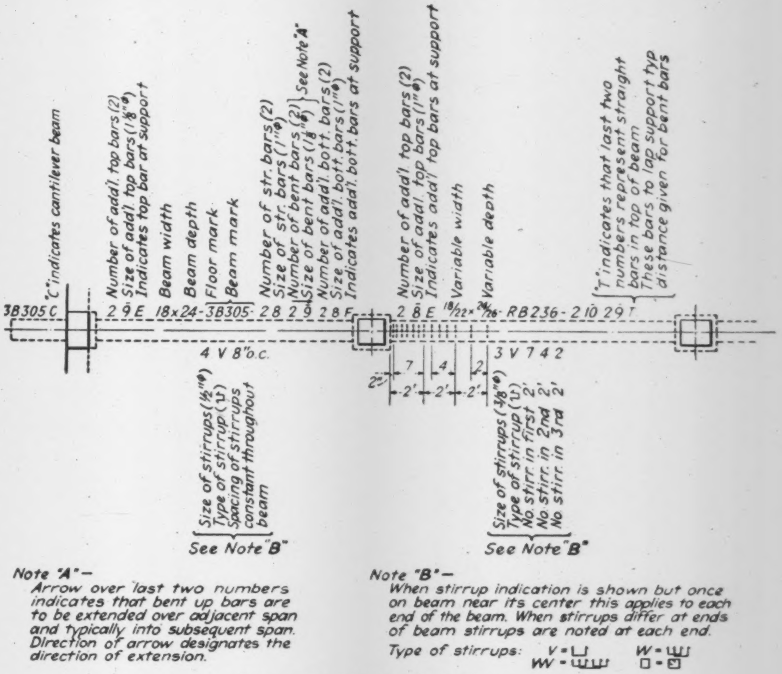
On the other side of the beam, as shown on the floor plan would be a corresponding notation such as "3W633". This would be translated to indicate that there were stirrups of ⅜ in. size of a design (W) indicated on the drawing, and show the required spacing.

These designations are explained in detail in the accompanying drawing.

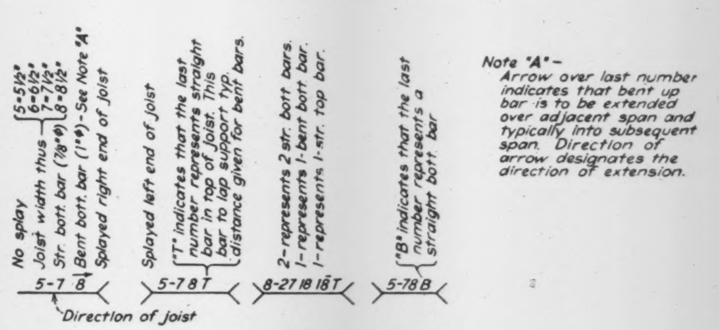
The Public Buildings Administration is under the direction of W. E. Reynolds, with L. A. Simon, supervising architect and Neal A. Nelick, supervising engineer. T. C. Brooks is chief of structural engineering.


20x20
8-9
18x20-4B306-2739
3W643
18x20-4B304-3829
3W633
18x26
12-8
3'-4"
3'-4"
20'

Method of making notations on plans.


"C" indicates cantilever beam
Number of add'l. top bars (2)
Size of add'l. top bars (1⅛"⌀)
Indicates top bar at support
Beam width
Beam depth
Floor mark
Beam mark
Number of str. bars (2)
Size of str. bars (1"⌀)
Number of bent bars (2)
Size of bent bars (1⅛"⌀)
See Note "A"
Number of add'l. bott. bars (2)
Size of add'l. bott. bars (1"⌀)
Indicates add'l. bott. bars at support
Number of add'l. top bars (2)
Size of add'l. top bars (1"⌀)
Indicates add'l top bars at support
Variable width
Variable depth
"T" indicates that last two numbers represent straight bars in top of beam
These bars to lap support typ distance given for bent bars
3B305 C
2 9 E 18x24-3B305- 2 8 2 9 2 8 F
2 8 E 18/22x24/26- RB236- 2 10 2 9 T
4 V 8" o.c.
3 V 7 4 2
7
4
2
2"
2'
2'
2'
Size of stirrups (½"⌀)
Type of stirrup ("U")
Spacing of stirrups constant throughout beam
See Note "B"
Size of stirrups (⅜"⌀)
Type of stirrup ("U")
No. stirr. in first 2'
No. stirr. in 2nd 2'
No. stirr. in 3rd 2'
See Note "B"
Note "A" —
Arrow over last two numbers indicates that bent up bars are to be extended over adjacent span and typically into subsequent span. Direction of arrow designates the direction of extension.
Note "B" —
When stirrup indication is shown but once on beam near its center this applies to each end of the beam. When stirrups differ at ends of beam stirrups are noted at each end.
Type of stirrups: V = W = WW = □ =

Concrete Beam Notation


No splay
Joist width thus 5=5½" 6=6½" 7=7½" 8=8½"
Str. bott. bar (⅞"⌀)
Bent bott. bar (1"⌀) - See Note "A"
Splayed right end of joist
Splayed left end of joist
"T" indicates that the last number represents straight bar in top of joist. This bar to lap support typ. distance given for bent bars.
2-represents 2 str. bott bars.
1-represents 1-bent bott bar.
1-represents 1-str. top bar.
"B" indicates that the last number represents a straight bott. bar
5-7 8
5-7 8 T
8-27 18 18 T
5-78 B
Direction of joist
Note "A" —
Arrow over last number indicates that bent up bar is to be extended over adjacent span and typically into subsequent span. Direction of arrow designates the direction of extension.

Concrete Joist Notation

Key to notation system showing explanation of symbols placed on plan drawings.

Highway Equipment Use and Salvage in North Carolina

B. W. Davis
Maintenance Engineer, N. C. State Highway and Public Works Commission

The North Carolina Highway department operates an unusually large fleet of highway equipment to maintain the 10,100 miles of dustless-mudless roads and 47,700 miles of other than hard surfaced roads of the state and county systems. Use cost of equipment is kept low and full value obtained from all machines by special salvage schemes.

About 450 cars, 430 small trucks, 2600 trucks of 1½ ton capacity and larger, 264 crawler tractors, 326 powered graders, 142 rock crushers, 43 gas shovels, and comparable quantities of other equipment make up the North Carolina motorized fleet. The estimated replacement cost of this equipment at current prices is $7,500,000 and the appraised value is $3,500,000.

The equipment is maintained and replaced by a system which requires no direct budget allotment from the highway funds. It is held by a Highway Equipment Department and is leased to other departments on a rental basis which returns sufficient revenue from the rent to pay the cost of all overhead, repairs, and replacements.

The maintenance work requires a force of 450 employees working in 35 shops throughout the state. All shops and traveling mechanics work under the direction of the central equipment office at Raleigh, North Carolina. The rental rates are low, most of them being less than 50 percent of regular commercial rates as indicated by these examples of monthly charges:

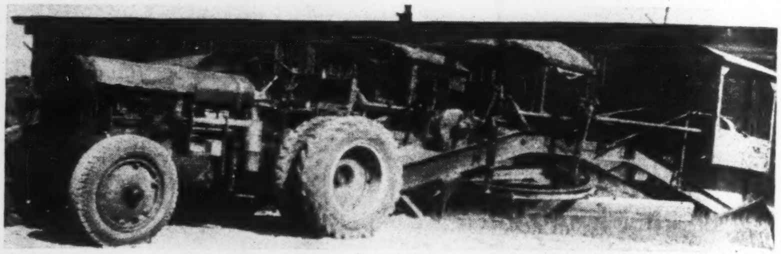
Car	$36.00
Dump truck, 1½ ton, with hydraulic hoist	60.00
Diesel powered crawler tractor (maximum drawbar 50 hp.)	105.00
1½ cu.yd. gas shovel	240.00

Rates on other equipment are in proportion. The rental covers the cost of all repairs and replacements (but does not include fuel and operators).

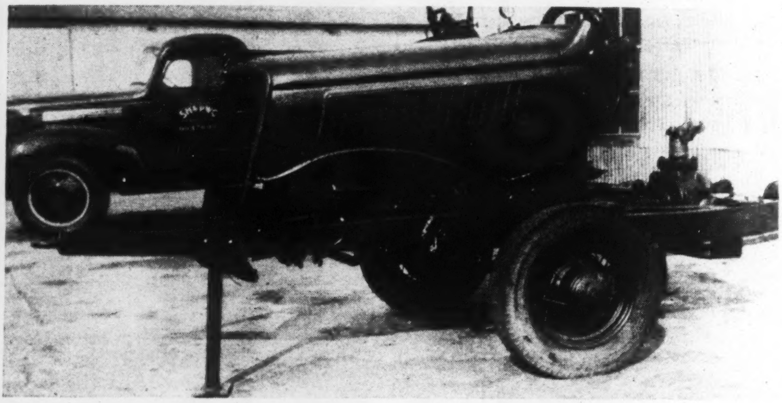
The equipment rental for the current fiscal year will be approximately $3,000,000, and of this amount about $1,200,000 will go into new units.

It is difficult to determine the point where further equipment repairs are uneconomical and replacement are advisable; but, roughly speaking, a light car that has been driven 75,000 to 100,000 miles, a 1½ ton dump truck that is four to five years old, or a tractor which requires repairs that will cost 60 percent of its replacement value should be given careful study before being rebuilt.

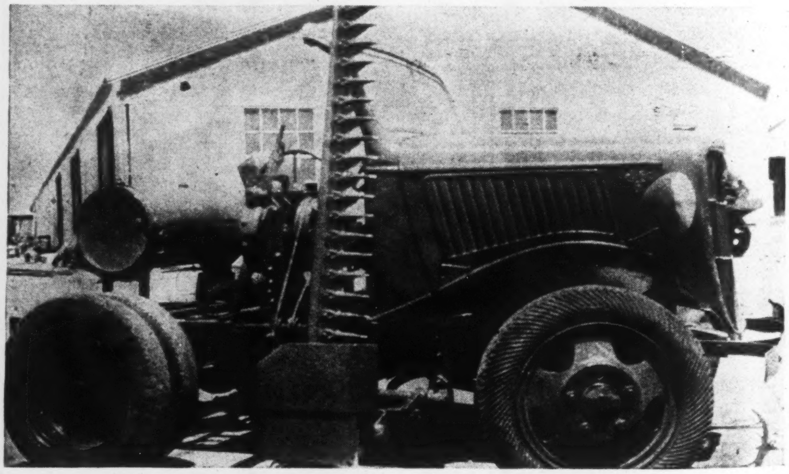
When equipment is discarded it is usually dismantled for parts to be used in rebuilding equipment of the same model, or it is reworked into special occasional-use machines as shown in the accompanying pictures.



Motor is salvaged from highway partol grader and made into wheeled tractor.



Automotive engine on original frame with wheels set rigid to make trailer is connected through clutch to 3 in. pump for unloading asphalt from tank cars.



Discarded pieces of equipment are assembled to make highway mowing machine.

From Field and Office

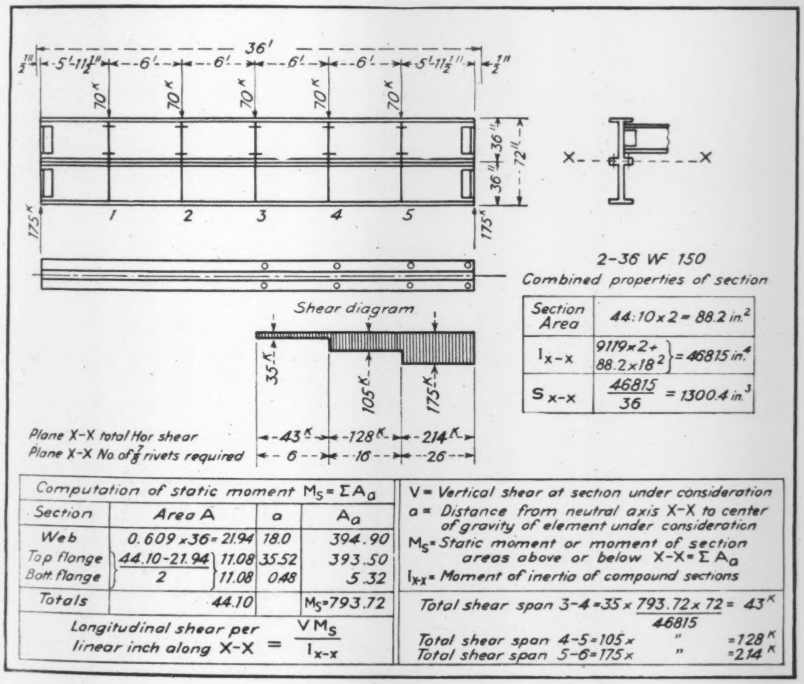
Working problems and time-saving methods for engineers and contractors

Substitute for Plate Girder

For loads beyond the capacity of the heaviest wide-flange beam section, numerous cases occur in practice where two rolled sections riveted together, flange to flange, afford an alternative to a built-up plate girder. Obviously, to function as a single unit, the two flanges in contact must be riveted or welded to resist the horizontal shear produced by the external loads. The accompanying calculation sheet, for example, shows how the horizontal shear forces between two 36-in. wide-flange beams under a given loading condition are determined. The two flanges in contact form a continuous horizontal web stiffener which substitutes for the usual vertical stiffeners in built-up girders.

A comparison of the two-beam combination with a built-up plate and angle girder of the same capacity would probably show an advantage in lightness for the built-up girder, but against this the cheaper and quicker fabrication of the two-beam combination would in many cases give the latter an all-round advantage. Also, the clean simple lines of the two beams compare very favorably in appearance with the usual plate girder construction.

Some years ago as an expedient the writer had occasion to combine two 15-in. beams in the above manner and they worked very satisfactorily. As a precaution against possible slipping the flange rivets were increased 25 percent above the calculated number. With the advent of large rolled sections, the scope for the two-beam combination has widened, and among other applications the smaller highway bridges would seem to invite consideration of the method.—J. F. P. TATE, New York, N. Y.



2-36 WF 150

Combined properties of section

Section Area	44.10 x 2 = 88.2 in.^{2}
I_{x-x}	9119 x 2 + 88.2 x 18^2 = 46815 in.^{4}
S_{x-x}	$\frac{46815}{36}$ = 1300.4 in.^{3}

Plane X-X total Hor shear	43ᴷ	128ᴷ	214ᴷ
Plane X-X No. of $\frac{7}{8}$ rivets required	6	16	26

Computation of static moment $M_S = \Sigma A_a$

Section	Area A		a	A_a
Web	0.609 x 36 = 21.94		18.0	394.90
Top flange	$\frac{44.10-21.94}{2}$	11.08	35.52	393.50
Bott. flange		11.08	0.48	5.32
Totals		44.10		M_S = 793.72

Longitudinal shear per linear inch along X-X = $\frac{V M_S}{I_{x-x}}$

V = Vertical shear at section under consideration

a = Distance from neutral axis X-X to center of gravity of element under consideration

M_S = Static moment or moment of section areas above or below X-X = ΣA_a

I_{x-x} = Moment of inertia of compound sections

Total shear span 3-4 = 35 x $\frac{793.72 \times 72}{46815}$ = 43ᴷ

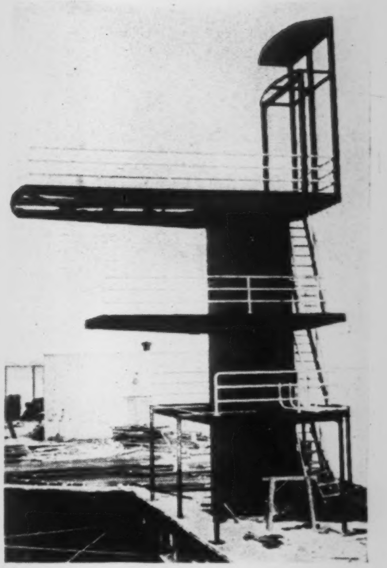
Total shear span 4-5 = 105 x " = 128ᴷ

Total shear span 5-6 = 175 x " = 214ᴷ

Calculation sheet for stresses in a girder fabricated out of two I-beams.

All-Welded Diving Tower

At the new modern swimming pool built at the New York World's Fair site where Billy Rose had his Aquacade (*ENR*, Aug. 14, 1941, p. 234), two all-welded diving towers of the type illustrated were erected. In the one illustrated the top cantilever is 8 meters above the water and the lower cantilever 5 meters above. The two arms of each cantilever were formed from channels by cutting triangular-shaped wedges from the channel's web in the cantilevered length and then forcing the two flanges toward each other to permit joining by a weld.



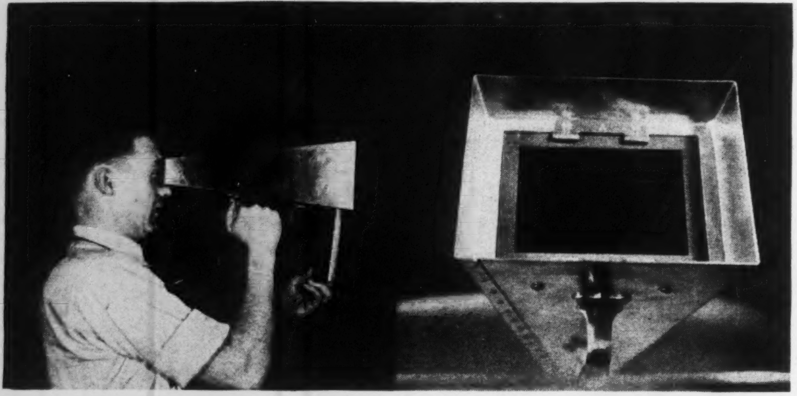
All-welded diving tower on site of New York's World's Fair Aquacade.

The low platform supported on the water side by three posts makes possible two springboards 3 meters above the water. In the area below this platform the orchestra will be seated when music for water shows or similar performances is desired.

Four 6x6x$\frac{5}{8}$-in. angles are used at the corners of the main shaft, which is enclosed by $\frac{1}{2}$-in. plate. In the section between the two cantilevers floodlights will be placed. Then in the very top of the tower, under the small roof already in place, sound equipment will be installed.

Velocity Gage for Measuring Pipeline Discharge

Velocity of dredge pipeline discharge is being determined by a new device developed in the operations division of the South Atlantic Division. U. S. Engineers. As shown by the illustrations the device is a hollow truncated pyramid of stainless steel. At the smaller end is an eyehole and in the larger end is slid a glass plate



Left: velocity gage being sighted for an observation. At right, end of gage, showing glass marked with velocity trajectories of pipeline discharge.

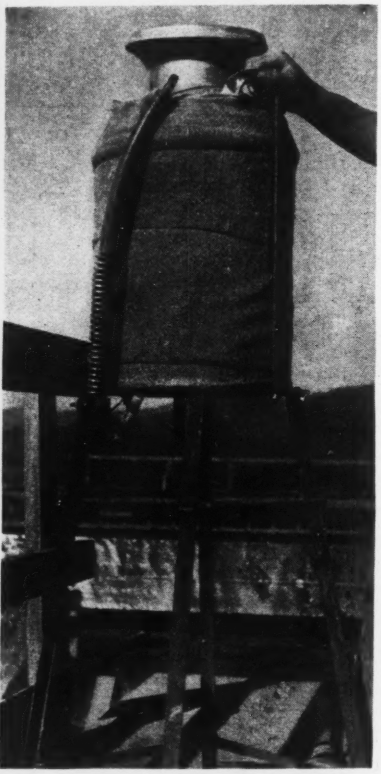
gage. This gage is essentially a lantern slide or diapositive copy of a set of trajectories for a series of velocities. The trajectories are for the fall of a moving body with initial horizontal motion when freed from restraint, in this case at the end of the pipe. For small inclinations the curves are closely correct. For convenience in orientation and calibration a horizontal line and a vertical line with graduations at 1-ft. intervals are shown. For the purpose of avoiding the upper surface of the discharged mixture, with its indefinite and irregular boundary, and to correspond more nearly with the average velocity of the mass, a reference point in the cross-section of the pipe was taken at 0.6 of the diameter down from the top.

From any convenient location near a discharging end of the pipe the observer examines the flow by looking through the glass plate held parallel to the discharge. By keeping the pipe between the corresponding marks while holding the glass at such a distance from the eye that feet on the gage-glass scale subtend feet at the center of the flow, the observer will see that the flow has a curve like one on the gage, or falls between two curves on the gage, and its velocity may be read directly. Accuracy of observation is dependent upon steadiness of flow; care in matching trajectories; proper position of the gage glass with respect to eye and pipeline; and on the precision of representation of the trajectories for the respective velocities.

The new velocity gage was designed by Lt. Col. R. M. Copeland, Corps of Engineers, U. S. Engineer Office, Richmond, Va.

Sanitary Drinking Fountain

A portable drinking fountain in use on Shasta Dam does away with the usual dipper or cup and automatically closes off the flow when not in use. The container is a 10-gal. milk can with a ½-in. pipe leading out from the center of the bottom. The pipe terminates in a rubber hose with a coil spring around its lower end; thus when the hose is bent downward so that water will flow out, the spring is under stress and will immediately return the hose to a vertical position when released. A metal tip or nipple is used in the end of the hose. The can is covered with burlap, wired on, which can be kept wet so that evaporation will cool the water.



Portable drinking fountain used on the job at Shasta Dam in California.

To support the can at convenient height a stand of light metal is used to which the can is fastened by a pair of steel rods with upper ends curved over the can's handles. The lower ends of the rods are drawn up against the stand by wing nuts.

The device was developed by Pacific Constructors, Inc., contractors on Shasta Dam.

Cutting Off Concrete Piles With Dynamite Charges

Construction of a new pier and transit shed for the navy at San Diego involved removing the deck and making use of the concrete piles that supported an old pier. There were some 2,000 of these old piles, principally 20 in. square with eight ¾-in. reinforcing bars, which had to be cut off about 5 ft. below the top. Cutting them down with a jackhammer was found to cost about $7.50 per pile. However, a method of doing the work with the aid of dynamite was developed which greatly speeded up the operation and reduced the cost to about $5 per pile.

The method followed was to drill a central hole 1½ in. in dia. to within 1 ft. of the level at which the cutoff was desired. The bottom 8 in. of this hole was filled with sand, one-third of a stick of 60-percent dynamite was then put in and the hole was tamped full of sand. The amount of powder and the proper depth of sand below it were determined by experiment: the objective was to get the maximum shattering possible without endangering any portion of the pile below the cutoff level.

Before firing the charge the pile was covered with a "blanket" of old canvas to prevent fragments from flying. After the charge had been fired workmen broke out, with sledges or jackhammers, the fractured concrete and trimmed the base off to the required level. To facilitate finishing off the concrete at the desired level, a groove was cut into the concrete, prior to the use of dynamite, entirely around the pile and 4x6-in. timbers were firmly bolted around the pile at this level. These timbers also served as a working base for the operations.

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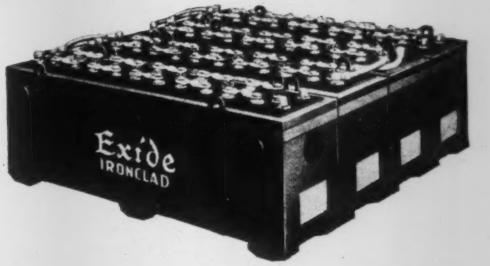

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CONTRACT UNIT PRICES

What contractors are bidding on different kinds of construction work

GRANBY DAM AND DIKES COLORADO

OWNER: Bureau of Reclamation, Colorado-Big Thompson Project; Walker R. Young, acting chief engineer, Denver, Colo.

PROJECT: Construction of Granby Dam, an earthen structure, across Colorado River, about five miles northeast of Granby, Colo. Outlet works are through left abutment of dam, and open-channel spillway also at left abutment. Length 865 ft.; height 225 ft. above river bed. Main body of dam to consist of moistened and rolled embankment of clay, sand and gravel. Upstream slope covered with 3-ft. thick layer of riprap; downstream slope with rock fill. Two concrete cut-off walls with footings extending to bed rock will be built in wide cut-off trench the full length of dam foundation. Spillway to be open channel in rock with concrete gate structure at crest of dam. Discharge through spillway controlled by two radial gates. Four earth-fill dikes with upstream slopes protected by riprap, and downstream portion rock filled to be built in low places in rim of reservoir area. (Spec. No. 979.)

CONDITIONS: Contractor to furnish sand, gravel, rock and aggregate; structural steel supports, lagging and tunnel-liner plates for permanent tunnel supports; temporary timbering; form materials, except absorptive form lining; welding rods; wire, wire ties; water; calking materials; insulating tape, etc., for electrical installations; and all other materials not part of completed construction work. Work to be completed in 1,140 calendar days. Railway transportation facilities available to Granby, and highways in vicinity of work. Labor rates are: skilled labor, $1.25 to $1.50 per hr.; semi-skilled, 70¢ to $1.10; and common, 62½ to 72½¢.

BIDS: Two bids were opened September 8, 1941, the low of $5,247,555 and $5,493,062.

LIST OF BIDDERS:

1. W. E. Callahan Constr. Co., Gunther & Shirley Co., Peter Kiewit Sons' Co., George W. Condon Co., Los Angeles, Calif. (low bid)	$5,247,555
2. Porter-DeWitt Constr. Co., United Constr. Co., Winona, Minn.	5,493,062

Item	Quan.	Unit Prices (1)	(2)
1. Diversion; care of river; unwater fndn.	L. S.	$25,000.00	$58,626.00
2. Excav., strip sand and gravel deposits	3,000 c. y.	.50	.29
3. Excavation, stripping borrow pits	200,000 c. y.	.30	.58
4. Com. excav., and separation of excav. for temporary diversion channel	35,000 c. y.	1.25	2.00
5. Rock excav., temp. diversion channel	1,000 c. y.	2.50	2.00
6. Com. excav., open cut and separ. of excav. for outlet works	15,000 c. y.	2.50	2.65
7. Rock excav., open cut for outlet works	7,000 c. y.	2.50	2.65
8. Excav., all classes, tunnel and shafts	7,800 c. y.	35.00	30.00
9. Permanent str. steel tunnel supports	20,000 lb.	.15	.15
10. Steel tunnel-liner plates and steel lagging	40,000 lb.	.10	.15
11. Common excav., and separation of excav. for dam foundation	250,000 c. y.	2.50	1.80
12. Rock excavation, dam foundation	15,000 c. y.	2.50	7.71
13. Com. excav., dike foundations	143,000 c. y.	.40	.19
14. Excav., all classes, conc. cut-off wall footings	1,000 c. y.	30.00	29.45
15. Com. excav., and separation of excav. for spillway	15,000 c. y.	2.00	3.32
16. Rock excavation, spillway	70,000 c. y.	2.00	3.32
17. Com. excav., separation of excav. in borrow pit No. 1, transport to dam and dike embank.	2,700,000 c. y.	.50	.60
18. Rock excav., as above	27,000 c. y.	2.50	1.75
19. Com. excav.; borrow pit 3A; trans. to dike No. 3 embank.	500,000 c. y.	.50	.60
20. Rock excavation, as above	5,000 c. y.	2.50	1.75
21. Com. excav., borrow pits 4 and 5, and trans. to embank. for dikes 1, 2 and 4	710,000 c. y.	.50	.50
22. Earth fill in embankments	3,200,000 c. y.	.25	.17
23. Cobble-and-rock fill, downstr. embank. slope	800,000 c. y.	.40	.46
24. Riprap, upstream slopes of embank.	120,000 c. y.	.50	1.16
25. 4-in. sew. pipe drains, uncem. jts., embed. in por. conc.	600 l. f.	3.00	2.50
26. 4-in. sew. pipe drains, uncem. jts., embed. in gravel	200 l. f.	3.00	2.90
27. 6-in., as above	100 l. f.	3.00	3.15
28. 8-in., as above	4,200 l. f.	3.00	2.70
29. 12-in., as above	1,500 l. f.	3.00	2.90
30. Por. conc. under floor spillway-gate str. and in horizontal bands about elevator shaft	60 c. y.	20.00	40.00
31. Drill weep holes	600 l. f.	2.00	1.70
32. Core drill 5½-in. holes, to 30-ft.	600 l. f.	25.00	6.00
33. 1⅜-in. grout holes to 30-ft	9,000 l. f.	3.00	1.75
34. As above, 30- to 50-ft.	4,500 l. f.	4.00	1.90
35. As above, 50- to 100-ft.	4,500 l. f.	5.00	2.05
36. As above, 100- to 150-ft.	6,000 l. f.	6.00	2.20
37. Place grout pipe and fittings	10,000 lb.	.30	.20
38. Pressure grouting	30,000 c. f.	2.00	1.40
39. Pressure grouting with packers	8,000 c. f.	2.50	1.70
40. Drill anchor bar holes; grouting bars in place	1,500 l. f.	1.00	1.61
41. Unformed conc.; footings and emb. cut-off walls	1,000 c. y.	30.00	25.77
42. Conc. in embk. cut-off walls, except as above	1,500 c. y.	50.00	65.25
43. Concrete in tunnel lining	2,400 c. y.	45.00	43.11
44. Conc. in shaft, gate-chamber, tunnel-plug lining	700 c. y.	25.00	54.44
45. Concrete in tunnel plugs	300 c. y.	25.00	50.68
46. Conc. in tunnel inlet and outlet struct.	300 c. y.	50.00	33.78
47. Concrete in trashrack structure	70 c. y.	50.00	42.52
48. Conc.; elev. shaft, above rock fndn. surf. for dam embnk.	250 c. y.	25.00	28.27
49. Conc. in elevator house	60 c. y.	50.00	75.00
50. Concrete in spillway	1,200 c. y.	35.00	51.74
51. Conc. in parapet and curb walls	3,300 c. y.	20.00	30.00
52. Place reinforcement bars	900,000 lb.	.03	.04
53. Place metal sealing strips	700 l. f.	1.00	1.58
54. Install metal doors, metal-sash windows, and metal louver in elev. house	L. S.	500.00	316.10
55. Install radial gates	60,000 lb.	.05	.12
56. Install radial-gate hoists	10,000 lb.	.05	.06
57. Inst. ring-follower gate, metal conduit linings	18,000 lb.	.05	.12
58. Inst. control apparatus and piping for ring-follower gate	2,500 lb.	.05	.12
59. Inst. needle valve and hollow-jet valve	11,000 lb.	.05	.12
60. Install outlet pipes	9,000 lb.	.05	.12
61. Install trashrack metalwork	40,000 lb.	.03	.08
62. Install float-well intake piping	1,000 lb.	.50	.22
63. Install pipe handrails	1,500 lb.	.80	.24
64. Install misc. metalwork	10,000 lb.	.50	.12
65. Inst. electrical metal conduit, to 1¼-in. dia	550 l. f.	.60	.64
66. As above, 1½-in. or larger	3,000 l. f.	.60	1.06
67. Inst. electrical conductors and ground wires	4,000 lb.	.60	.13

BASCULE BRIDGE, FLORIDA

OWNER: Dade County Commissioners, Edmund Friedman, county engineer, Miami, Fla. J. E. Greiner Co., Baltimore, Md., consulting engineers.

PROJECT: Construction of 120-ft. bascule bridge and piers over Biscayne Bay, a part of the Biscayne Causeway; roadway width 44-ft.; 80-ft. clear opening.

CONDITIONS: Contractor to furnish all materials and complete work by November 1, 1942. Rail, highway and water transportation facilities available. Wage rates are: skilled labor, $1.12½ to $1.62½ per hr.; semi-skilled, 65c. to $1.00; and common, 62½c.

BIDS: Two bids were opened July 8, 1941, the contract low of $288.377 and $394,680.

LIST OF BIDDERS:

1. Reed Constr. Co., Miami, Fla. (contract)	$288.377
2. P. J. Carlin Constr. Co., New York, N. Y.	394.680

Item	Quan.	Unit Prices (1)	(2)
1. Wet excavation, bascule piers	1.990 c. y.	$5.75	$30.00
2. Untreated timber piling	9.300 l. f.	.325	.50
3. Drive untr. timber piling	9.300 l. f.	.488	.70
4. Tremie conc. seal for basc. piers	770 c. y.	21.55	25.00
5. Cl. A conc.; basc. piers and oper. house	1,890 c. y.	32.65	30.00
6. Reinforcing steel	230,000 lb.	.0556	.07
7. Protective coating conc. work	1,200 s. y.	1.08	2.00
8. Structural steel	665,000 lb.	.127	.18
9. Open grid steel decking	5,600 s. f.	3.75	3.00
10. Cast steel track girder plates and rolled steel segment. girder plates	30.400 lb.	.28	.25
11. Machinery equip. except speed reducers for basc. span	25,000 lb.	.50	.60
12. Speed reducers for basc. span	L. S.	2.708.00	3.000.00
13. Electrical equipment	L. S.	21.365.00	36.900.00
14. Roadway gates	6 ea.	602.00	1.500.00
15. Class A conc. in counterweights	147 c. y.	54.00	30.00
16. Operator's house	L. S.	2,945.00	5.000.00
17. Treated timber piles in fenders	4,600 l. f.	1.50	1.60
18. Treated timber in fenders	22 Mbm.	229.65	250.00

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MATERIALS AND LABOR PRICES

Market quotations on construction materials and wage rates reported monthly by ENR correspondents

LUMBER PRICES continue to be the most active in the construction material price list in October. Short-leaf yellow pine is $1.00 to $2.00 higher in Chicago; up to $1.50 to $2.50 in Cincinnati; $2.00 to $4.00 higher in Detroit; up $2.00 to $8.75 in New Orleans; but $2.50 to $5.00 lower in Kansas City; and off 50c. to $2.00 in St. Louis.

Douglas fir increased $1.00 to $5.00 in Chicago; up $2.00 in Minneapolis; $1.00 to $2.00 in New Orleans; $2.00 to $4.00 in Seattle; and up $11.00 to $12.00 in Los Angeles.

Paving asphalt increased $1.00 per ton in Cleveland, and is $2.00 per ton higher in drums in Seattle. Vitrified sewer pipe is up in Minneapolis and San Francisco; and structural clay tile rose in Cincinnati, Minneapolis and St. Louis. Paving brick is off $2.50 per M in Chicago.

Cement, sand, gravel, structural steel shapes and reinforcing bars are unchanged from a month ago.

Construction wage rates, both in the common and skilled labor field remain at their September levels.

CEMENT, AGGREGATES, READY-MIXED CONCRETE—F.O.B. CITY

	PORTLAND CEMENT			SAND AND GRAVEL			CRUSHED STONE		CRUSHED SLAG		CONCRETE
	Per bbl., carload lots, including 40c per bbl. for bags, cash discount not deducted			Per ton, carload lots			Per ton, carload lots		Per ton, carload lots, f.o.b. plant		Ready Mixed 1:2:4, 50 c.y. or more, delivered
	Cloth Bags a	Paper Bags	Bulk	Gravel, 1½ in.	Gravel, ¾ in.	Sand	1½ in.	¾ in.	1½ in.	¾ in.	
Atlanta	$2.90	$2.66	$2.61	$1.75	$1.85	$1.95	$1.75	$1.85	$1.55	$1.65	$7.90
Baltimore	2.36	2.11	1.91	1.75‡	1.75‡	1.25‡	1.75‡	1.75‡	1.75‡	1.75‡	7.00
Birmingham	2.50	2.25	2.05	1.75	1.75	1.40/1.50	1.00	1.00	.90	1.15	5.80
Boston	2.75b	2.50b	2.30	1.40‡	1.40‡	1.00‡	1.40‡	1.40‡	....	....	7.00m
Chicago	2.60	2.35	2.20	2.00‡d	2.00‡d	2.00‡d	2.00‡d	2.00‡d	1.50‡	1.50‡	....
Cincinnati	2.31	2.06	1.81	1.20	1.20	1.10	1.80	1.80	....	....	6.60
Cleveland	2.29	2.04	....	1.50i	1.50i	1.30i	1.90i	1.90i	1.70i	1.70i	7.30i
Dallas	2.47	2.22	2.02	1.75p	2.00p	1.25p	1.69p	1.84p	....	....	6.20
Denver	3.08	2.83	....	1.20	1.40	.90	....	....	....	....	7.25
Detroit	2.24	1.99	1.79	1.31	1.41	.91	1.50	1.50	1.65‡	1.65‡	6.50
Kansas City	2.56	2.31	2.16	1.85	2.30	1.00	1.91	1.91	....	....	7.25n
Los Angeles	2.25b	2.05b	....	1.00	1.00	1.00	1.00f	1.00f	....	....	5.85
Minneapolis	2.90	2.65	....	1.00h	1.00h	.25h	1.00h	1.00h	....	....	7.35j
Montreal	....	1.95rs	1.79rs	....	....	1.25‡t	.85‡ct	1.00‡ct	....	....	6.45ls
New Orleans	2.41	2.16	1.96	1.50	1.50	1.25	....	....	....	....	7.25
New York	2.55‡	2.30‡	....	1.50de	1.50de	.90de	1.65de	1.75de	....	....	6.75
Philadelphia	2.32	2.07	1.87	1.55‡	1.65‡	1.35‡	....	....	1.10	1.10	8.20k
Pittsburgh	2.44	2.19	1.99	1.40‡	1.40‡	1.70‡	2.25‡	2.25‡	1.50	1.50	8.25
St. Louis	2.55	2.30	....	1.50‡	1.50‡	1.25/1.50‡	1.10h	1.10h	.75g	.75g	7.75
San Francisco	2.16	1.96	1.66	1.36	1.36	1.36	1.46	1.46	....	....	6.95
Seattle	2.95o	2.70o	....	1.00o	1.00o	1.00o	2.00o	2.00o	....	....	7.25

‡ Delivered. *a* 10c. allowed for each returnable bag. *b* 10c. per bbl. off for cash. *c* Plus municipal tax. *d* Per cu. yd. *e* Barge lots alongside docks. *f* Crushed granite. *g* F.o.b. Granite City, Ill. *h* F.o.b. plant. *i* Within three miles of Public Square. *j* 5% discount for cash. *k* Discount 35c. 500 to 2000; 70c. 2000 to 5000; 95c. over 5000. *l* Up to 200cu. yd. *m* 50c. off for cash. *n* 25 c.y. or more. *o* 2% off for cash. *p* 10c. per ton off, cash 15 days. *r* 10c. per bbl. off, cash 20 days. *s* 8% sales tax included. *t* 8% sales tax not included.

CASH DISCOUNTS CEMENT to Contractors: truck delivery. 2% for cash on 10th of month; on carload deliveries, no trucking, same as dealer cash discount 10c. per bbl. for payment within 15 days of date of invoice. Subject discount 10c per bbl. 20 days in Montreal.

CURRENT MAXIMUM PRICES RECEIVED AT CEMENT MILL

Charge for bags not included. For cloth bags, add 40c. per bbl.; 10c. refund allowed for each returnable bag; for paper bags add 15c. per bbl., not refundable.

	Bagged	Bulk
Buffington, Ind.	$1.70	$1.65
Dallas, Tex. (Inc. 10c. tax)	1.85	1.80
Hannibal, Mo.	1.70	1.65
Hudson, N. Y.	1.75	1.70
Independence, Kans.	1.70	1.65
Ironton, Ohio	$1.60	$1.55
Limedale, Ind.	1.70	1.65
Norfolk, Va.	1.65	1.60
Northampton, Pa.	1.55	1.50
North Birmingham, Ala.	1.70	1.65
Richard City, Tenn.	$1.80	$1.75
Steelton, Minn.	1.80	1.75
Universal, Pa.	1.65	1.60
Waco, Tex (Plus 10c. tax in Tex.)	1.75	1.70
Montreal (8% sales tax incl.)	1.68	1.67

PAVING BRICK, BLOCKS, ASPHALT, ROAD OILS—F.O.B. CITY

	PAVING BRICKS AND BLOCKS			PAVING ASPHALT		ASPHALT BINDERS—FLUXES		CUTBACK ASPHALT		ROAD OILS	ASPHALT EMULSION (Quick-breaking)	
	Granite per M. lots of 50,000 4x4x8 in.	Brick per M. 3-4x8½ in. carload lots	Wood per sq. yd. 3½ in. 16-lb. treat	Per ton, less than 80 penetration		Per gal., 80 300 penetration		Per ton		Per gal.	Per gal.	
				Tank car	Drums	Tank car	Drums	Tank car	Drums	Tank car	Tank car	Drums
Atlanta	$73.00	$39.35	$2.25	$17.30e	$23.83e	$0.0695e	$0.1018e	$0.0734he	$0.1257h	$0.0634e	$0.0734	$0.1257
Baltimore	165.00‡	45.00‡	2.90	14.00	20.00	.06	.09	.065h	.115h	......	......	......
Birmingham	......	24.50j‡	....	18.20	23.20	.0747	.1047	.0834h	.1484h	......	......	......
Boston	90.00	50.00	3.50	14.00	20.00	.06	.09	.065h	.115h	.065	.09‡	.12‡
Chicago	150.00	47.50	1.85d	14.50	18.50	13.00g	17.00g	.065h	.11h	.055	.095	.13
Cincinnati	112.00	37.50	....	14.00	18.00	.08	......	16.80	......	.0625	......	.085
Cleveland	110.00	39.00	2.25	18.50	23.50	.085	.105	.105h	11.00	.0675	.08	.09
Dallas	......	36.00	....	13.25	20.30	.06	.103	15.00	24.80	.055	.05/.07	.07/.09
Denver	......	27.50	....	....	......	......	......	......	......	......	......	......
Detroit	......	35.00	....	14.10f	19.00f	.061	.1025	14.10	18.60	.0425	.0645	.098
Kansas City	......	40.00	....	18.50	23.50	.077	.1075	.077h	.107h	.057	.11	.15
Los Angeles	......	50.00	....	6.50b	15.00	6.50bg	15.00bg	5.50b	......	.0192	.0525	.1125
Minneapolis	......	......	1.90d	21.20m	27.70	.10m	.126	19.00m	32.64	.06m	......	......
Montreal	75.00k	......	3.62k	16.60k	24.25k	.116k	.1485k	.115hk	.135hk	.08k	.135k	.188k
New Orleans	......	......	....	14.00a	19.00a	.055	.085	.06h	.09h	......	.078	......
New York	......	......	2.90	15.00	21.00	.06	.09	.065h	.115h	......	......	......
Philadelphia	120.00	42.50	2.84	15.00	22.00	.06	.12	.07h	.13h	.06	.07	.13
Pittsburgh	135.00	38.75	....	......	......	......	......	......	......	......	......	......
St. Louis	115.00/125.00	37.00	....	14.00	19.00	14.00g	19.00g	.06h	.095h	.04	.09	.125
San Francisco	......	70.00	....	6.50	15.00	6.50g	15.00g	7.00	17.50	.025	.0525	.1125
Seattle	......	60.00c	....	15.70	26.10	......	26.10g	11.50/12.50	25.00/26.00	9.75g	.0575i	.130ci

‡ Delivered. *a* F.o.b. Baton Rouge. *b* Delivered to purchaser's warehouse. *c* 3½x4x8½ in. *d* 2½ in. 6 to 8-lb. treatment. *e* Local reduction due to 20% reduction intra-state class freight rates, only Georgia affected. *f* Mexican *g* Per ton. *h* Per gallon. *i* F.o.b. Martinez. *j* 3x3⅝x8½ in. *k* tax included. *m* August prices; tank car price withdrawn in September.

MID-VALLEY TRUCKING CO.
Y279F

"GULF helped us get ahead of a fast contract schedule"

— says contractor on huge airport project*

"We credit the extra protection value of Gulf Lubricants and the top-notch performance of Gulf Fuels for our efficient operating record."

"THE contract on this job calls for an extremely fast work-schedule, so right at the start we standardized on Gulf quality lubricants and fuels," says Contractor on huge airport project. "The extra hours we have saved through good lubrication and top-notch fuel performance have enabled us to get well ahead of that schedule."

Gulf lubricants and fuels are helping scores of contractors do a *speedier, more profitable job.* You can benefit on *your* next job by using these quality products. They are quickly available to you through more than 1200 warehouses in 30 states from Maine to New Mexico. Write or 'phone your nearest Gulf office today.

*Mauger Construction Company of Columbus, Ohio, and Charleston, West Virginia, and the F. C. Samons Construction Company (associated with the foregoing) of Huntington, West Virginia, are moving an average of 27,000 cubic yards a day on this huge airport project at Cumberland, Maryland, with the help of Gulf quality lubricants and fuels.

GULF OIL CORPORATION · GULF REFINING COMPANY
Gulf Building · Pittsburgh, Pa.

GULF

IRON AND STEEL PRODUCTS—BASE MILL PRICES

	STRUCT. SHAPES-PLATE	REINF. BARS ¾-in. billet *b*	RIVETS ½-in. structural	WIRE NAILS Base *d*	SHEET PILING Base	STEEL RAILS Per Gross Ton Standard	Light	Re-rolled	TRACK SUPPLIES Angle Bars	Std. Spikes *c*	Tie Plates *c*	Track Bolts
Birmingham	$2.10	$2.15	$3.75	$2.55	.....	$40.00	$40.00	$39.00	$2.70	$3.00	$2.15	$4.75
Chicago	2.10	2.15	3.75	2.55	$2.40	40.00	40.00	39.00	2.70	3.00	2.15	4.75
Pittsburgh	2.10	2.15	3.75	2.55	2.40	40.00	40.00	39.00	2.70	3.00	2.15	4.75
Buffalo	2.10	2.15	.....	.....	2.40	.....	.....	.....	.....	.....	2.15	....
Cleveland	2.10	2.15	3.75	2.55	.....	.....	.....	.....	.....	.....	.....	....
Youngstown	.....	2.15	.....	.....	.....	.....	.....	.....	.....	3.00	.....	....
Detroit	.....	2.25‡	.....	.....	.....	.....	.....	.....	.....	.....	.....	....
Gulf ports	2.45*a*	2.50*a*	.....	.....	2.85*a*	.....	.....	.....	.....	.....	.....	....
Pacific ports	2.75*a*	2.80*a*	.....	.....	2.95*a*	.....	.....	.....	.....	.....	2.30	....

‡ Delivered. *a* F.o.b. cars dock. *b* Rail steel same as billet prices. *c* Other basing points include Portsmouth, O., Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., and Pacific coast ports, on tie plates, alone, Steelton, Pa., on spikes alone, Lebanon, Pa., Richmond, Va. *d* Add switching charge $18 per c.l.

IRON AND STEEL PRODUCTS—F.O.B. WAREHOUSE, PER 100 LB., BASE PRICE

	STRUCTURAL SHAPES Per 100 lb. base price	REINFORCING BARS* Per 100 lb., ¾ in., base price 15 tons or over *b* New billet	Rail steel	Add Switch	$/cwt. for Del.	EXPANDED METAL LATH Per 100 sq.yd., carload lots Std. diamond mesh, 3.4 lb.	Std. ribbed 3.4 lb.	WELDED FABRIC REINFORCING Per 100 s.f., carload lots 4x16 in., No. 5 & 10 wires	4x12 in., No. 8 & 12 wires	6x6 in. No. 6 & 6 wires Per sq. yd.	SHEET PILING Per 100 lb. base price
Atlanta	$2.34	$2.39	$2.39	.02½	.10	$21.06	$23.00	$1.82	$1.35	$0.1719	$3.04
Baltimore	3.70	2.90	2.75	......	.10	30.00	31.00	1.70	1.27	.1611	3.00
Birmingham	2.10*a*	2.15	2.15	.02½	.10	19.00	21.50	1.80	1.34	.1701	....
Boston	3.75	3.11	3.01	$20 C.L.	.10	17.00	19.00	1.76	1.31	.1656	2.77
Chicago	2.10*a*	2.15	2.15	.03	.05	21.00	23.00	1.67	1.25	.1575	2.40
Cincinnati	3.68	2.51*cd*	2.51*cd*	......	.05	19.50	21.50	1.66	1.25	.1566	....
Cleveland	3.58*g*	2.15	2.15	.02½	.10	19.50	21.50	1.66	1.25	.1566	....
Dallas	6.00	3.40	3.40	......	.....	24.50	26.50	1.93	1.42	.1827	....
Denver	4.35	3.95	3.80	......	.....	26.50	28.50	1.97	1.45	.1863	....
Detroit	3.65‡	2.25	2.15	......	.10	22.00	24.00	1.68	1.26	.1584	2.66
Kansas City	4.17	2.51*cd*	2.36*cd*	.0	.05	19.50	23.50	1.78	1.33	.1683	2.86
Los Angeles	3.65*f*	2.25	2.10	.02½	.05	23.00	27.50	1.93	1.42	.1827	3.65
Minneapolis	3.80‡	2.48*c*	2.48*c*	.0	.10	25.00	27.00	1.80	1.34	.1701	2.73*d*
Montreal	3.90*i*	2.65*i*	2.55*i*	......	.....	26.00*hi*	33.00*hi*	2.58*i*	3.22*i*	.264*i*	
New Orleans	4.40	2.52	2.52	.05	.10	21.50	23.50	1.82	1.35	.1719	2.875
New York	3.75	2.76*c*	2.76*c*	......	.15	18.50	20.50	1.76	1.32	.1665	2.74
Philadelphia	3.75	2.66	2.56	......	......	19.50	21.50	1.71	1.28	.1611	2.72
Pittsburgh	2.10*a*	2.15	2.15	.02½	.10	23.00	26.50	1.59	1.20	.1503	2.40
St. Louis	3.69	2.39	2.39	.0	.05	22.50	26.00	1.69	1.27	.1602	2.70
San Francisco	4.70	2.65	2.50	.02½	.10	19.00	25.50	1.93	1.42	.1827	3.25
Seattle	2.75*e*	2.50*e*	......	......	......	34.50	38.50	1.93	1.42	.1827	2.95*e*

‡ Delivered. *a* Mill prices. *b* 5–15 tons, add 15c. 1–5 tons, add 25c. Less than 1 ton, add 50c. *c* 20 tons or over Base. *d* Mill price plus freight. *e* F.o.b. dock. *f* Includes delivery in free delivery zone. *g* Less than 1 ton, add 25c.; 1 to 5 tons, add 10c. High scrap steel prices cut former 15c. differences between new billet and rail steel in many mills. *h* List price. *i* Plus Dominion and Province sales tax.

PLUMBING, HEATING, WATER, SEWER AND DRAIN PIPE

	C. I. PIPE Per net ton f.o.b. 6 in. to 24 in.*a*	VITRIFIED SEWER PIPE Per foot, std. 8 in., s.s.	delivered std. 12 in., s.s.	ASTM 24 in.,	C13–35 36 in.,	CLAY DRAIN TILE Per 1,000 ft., carload lots, f.o.b. 6 in.	8 in.	CONCRETE SEWER PIPE Per ft., delivered; ASTM 12 in.	C 14–35 24 in.	WROUGHT STEEL PIPE Full standard weight, *h* 1 to 2 in., Butt Weld Black %	Galv. %	3½ to 6 in.; Lap Weld Black %	Galv. %
Atlanta	$49.40	$0.26*b*	$0.468*bc*	$1.8525	$4.68*c*	$85.00	$128.00	$0.45	$1.642	62.2	54.2	59.7	51.2
Baltimore	52.80	.45	.70	2.50	6.90	120.00	160.00	.75	2.00	65.5	57.5	63.0	54.5
Birmingham	45.00	.275	.495	1.95	4.66	100.00	220.00	.40	1.60	62.2	54.2	59.7	51.2
Boston	55.00	.35	.675	1.98	5.64	202.50‡	315.50‡	.55	2.05	64.1	56.1	61.6	53.1
Chicago	53.80	.28	.54	2.25	6.25	100.00‡	150.00‡	.38	1.48	67.0	59.0	63.5	55.0
Cincinnati	52.70	.231	.4455	1.80	5.125	105.00	170.00	.60	1.70	65.9	57.9	63.4	54.9
Cleveland	54.24	.238	.459	1.89	5.33	78.60	125.00	.35	1.50	67.8	59.8	65.3	56.8
Dallas	58.20	.305	.549	2.25	5.00	90.00	110.00	.46	1.57	59.9	51.9	57.3	48.3
Denver	60.60	.24†	.52†	2.16†	......	130.00	240.00	....	....	58.4	50.4	55.7	47.2
Detroit	54.24	.245	.4725	1.935	4.60	69.10	108.00	.33	1.50	66.3	58.3	63.8	55.3
Kansas City	55.12	.315	.59	2.20	5.86	140.00	260.00	.45	1.60	62.9	54.9	60.0	51.5
Los Angeles	55.00	.282†	.508†	2.034†	5.085†	115.50	192.50	1.00	2.00	59.6	51.6	57.0	49.6
Minneapolis	59.00	.275†	.495†	1.98†	5.14†	......	....	.70	1.80	64.2	56.2	60.7	52.2
Montreal	60.00	.55	.90	3.68	5.95*e*	135.00‡	260.00‡	.48*l*	1.92*l*	......	......	......	....
New Orleans	51.38	.26	.48	1.69	......	150.00	220.00	.37	2.10	62.4	54.4	58.8	50.3
New York	52.20	.455	.8775	2.925	7.65	......	......	.50	1.20	64.9	56.8	62.4	53.9*i*
Philadelphia	50.90	......	......	......	......	......	......	.54	1.80	65.3	57.3	62.8	54.3
Pittsburgh	55.60	.245†	.4725†	1.845†	5.4325	97.80	154.20	.85*g*	2.00*g*	68.5*i*	57.5*i*	66.0*i*	54.5
St. Louis	52.48	.28	.504	2.016	4.50	85.00	220.00	.90*j*	1.60*k*	65.1	57.1	62.0	53.5
San Francisco	55.00	.3625*d*	.6525*d*	2.61	6.52	115.50	192.50	.54	2.50	45.0	31.0	47.0	34.5
Seattle	55.35	.35	.63	2.52	6.30	72.00	175.00	.45*f*	1.40*f*	......	......	......	....

‡ Delivered. † F.o.b. *a* B. & S. class B and heavier, C/L lots, 200 tons and over Burlington, N.J. (base) $49.00. Gas pipe and class A, $3 per ton additional, 4 in., $3 per ton additional, 30 in. and larger usually $2 per ton less. *b* Double strength. *c* List to dealer. *d* List. *e* 30-inch. *f* Less 5% for cash. *g* Culvert pipe. *h* Discounts from standard list consumers carload prices, except Pittsburgh prices are f.o.b. mill. Base price $200 per net ton. List prices per ft.: ½ in., 8½c.; ¾ in., 11½c.; 1 in., 17c.; 2 in., 37c.; 2½ in., 58½c.; 3 in., 76½c.; 4 in., $1.09; 6 in., $1.92. *i* Applies also at Lorain, Ohio, mills. Chicago delivered base is 2½ points less on butt, 1½ on lap. Freight is figured from Pittsburgh, Lorain, O., Chicago Dist. Billing is from point producing lowest price at destination. WROUGHT IRON PIPE: Base price and list prices per ft. same as wrought steel pipe. Discount for Pittsburgh base: Butt-weld—1 in. and 1¼ in. black 34, galv. 16; 1½ in. black 38, galv. 18½; 2 in. black 37½, galv. 18. Lapweld—2½ in. to 3½ in. black 31½, galv. 14½ in.; 4½ in. to 8 in. black, 32½ galv. 17. *j* Reinforced; spec C 76-37. *k* Reinforced; spec. C 75-37. *l* Plus sales tax.

MORE than three-quarters of our current production is now being required for direct and indirect National Defense projects—camps, naval bases, airports, munitions plants, defense housing construction, et cetera. The large part which cast iron pressure pipe is playing in National Defense is a compliment, not only to its durability and economy, but to the judgment of water works, sewage works and gas engineers who prefer it above all other materials for underground main construction.

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U.S.
cast iron
PIPE

Centrifugally or Pit Cast for water works, gas, sewerage, drainage and industrial services.

LUMBER, TIMBER, PLYWOOD—PER M FT., B.M., CARLOAD LOTS F.O.B.

SHORT LEAF YELLOW PINE AND DOUGLAS FIR: All S. L. Y. P. is No. 2 common or better and for No. 1 N. C. Box. (Prices in Bold Face) *All Fir planks No. 2 common, Fir timber is No. 1 common. Lengths up to 20 ft. (Prices in italics)*

LONG LEAF Y. P.: Merchantable grade up to 20 ft.

PLYWOOD*: Rail freight increment (See note for base price)

	1x6 S4S	1x8 S4S	2x4 S4S	2x6 S4S	2x8 S4S	2x10 S4S	3x12 Rgh	6x12 Rgh	12x12 Rgh	Long Leaf 2x12 Rgh	Long Leaf 12x12 Rgh	Plywood 5/8"	
Atlanta	**$29.00**	**$29.00**	**$26.00**	**$28.00**	**$28.50**	**$30.00**	**$43.00**	......	......	$50.00	$55.00	$17.75	$21.60
Baltimore	**38.00**	**39.00**	**39.00**	**37.00**	**37.00**	**39.00**	**55.00**	......	......	87.00	92.00	17.35g	21.15g
	43.00	*43.00*	*44.00*	*44.00*	*44.00*	*46.00*	*55.00*	*$58.00*	*$58.00*	......	......	......	
Birmingham	**34.50**	**34.50**	**32.00**	**32.00**	**32.00**	**34.00**	**53.00**	**51.00**	**53.00**	......	......	16.25	19.85
[1]	37.50	37.50	37.00	37.00	37.00	43.00	65.00	......	......	67.50	70.00	......	..
Boston	38.00[2]	38.00[2]	45.00[3]	45.00	70.00[1]	75.00[1]	85.00[1]	......	......	85.00	90.00	17.35g	21.15g
	40.00	*40.00*	*50.00*	*50.00*	*50.00*	*50.00*	*70.00*	*75.00*	*75.00*	......	......	......	...
Chicago	**44.00**	**42.00**	**42.00**	**42.00**	**43.00**	**45.00**	**53.00**	......	......	90.00	100.00	13.80	16.80
	46.00	*44.00*	*44.00*	*44.00*	*45.00*	*47.00*	*50.00*	*50.00*	*50.00*	......	......	......	......
Cincinnati	**40.00**	**41.50**	**38.00**	**39.50**	**40.00**	**41.00**	**52.50**	......	......	60.00	63.00	16.25	19.85
	......	......	......	......	......	......	*54.50*	*54.50*	*54.50*	......	......	......	......
Cleveland	**42.00**	**42.00**	**42.00**	**42.00**	**43.50**	**47.00**	**55.00**	55.00	55.00	90.00	90.00	16.70	20.40
Dallas e	**38.00**	**39.00**	**38.00**	**36.00**	**37.00**	**38.50**	**52.50**	**52.50**	**52.50**	76.00	81.00	13.90	16.95
Denver ‡	54.00[4]	51.00[4]	54.00[4]	54.00[4]	54.00[4]	56.00[4]	57.00[4]	63.00[4]	70.00[4]	......	......	9.90	12.05
Detroit	**46.00**	**46.00**	**46.00**	**46.00**	**46.00**	**48.00**	**53.00**	......	......	53.00	61.50	16.25	19.85
	......	......	......	......	......	*51.50*	*54.00*	*60.00*	*60.00*	......	......	......	......
Kansas City	**42.50**	**45.00**	**42.50**	**42.50**	**45.00**	**47.50**	**55.00**	......	......	70.00	75.00	12.25	14.95
	50.00	*50.00*	*47.50*	*47.50*	*47.50*	*50.00*	*60.00*	*70.00*	*70.00*	......	......	......	......
Los Angeles a	*52.00*	*52.00*	*50.00*	*50.00*	*52.00*	*52.00*	*56.00*	*65.00*	*56.00*	......	......	9.35gh	11.35gh
Minneapolis ‡b	48.00[6]	48.00[6]	......	......	......	......	......	......	......	......	......	12.05	14.70
‡	*50.00*	*50.00*	*52.00*	*51.00*	*51.00*	*52.00*	*58.00*	*61.00*	*61.00*	......	......	......	......
Montreal †[7]	*36.00*	*38.00*	*36.00*	*38.00*	*40.00*	46.00	......	......	......	155.00	165.00	......	......
	53.50	*53.50*	*54.25*	*54.25*	*59.25*	*59.25*	*65.00*	*65.00*	*65.00*	......	......	......	......
New Orleans	**31.50**	**31.50**	**33.75**	**31.75**	**32.00**	**34.25**	**48.00**	......	......	58.50	69.00	13.90	16.95
	31.00	*31.00*	*33.00*	*31.00*	*31.00*	*32.00*	*33.00*	......	......	......	......	......	......
New York ‡	**47.00**	**48.00**	**46.00**	**48.00**	**49.00**	**50.00**	**59.00**	......	......	100.00f	110.00f	17.35g	21.15g
‡	......	......	*65.00*	*65.00*	*65.00*	*65.00*	*67.50*	*70.00*	*70.00*	......	......	......	......
Philadelphia	**24.00**	**24.50**	**25.50**	**25.50**	**27.50**	**27.50**	**29.00**	......	......	50.00	57.50	17.35g	.1512g
	35.00	*36.50*	*39.00*	*38.25*	*29.00*	*39.00*	*44.00*	*32.00*	*32.00*	......	......	......	......
Pittsburgh	**50.80**	**53.20**	**62.75**	**55.00**	**60.85**	**62.50**	**76.25**	......	......	......	......	17.00	20.70
	69.20	*68.10*	*66.10*	*65.30*	*65.20*	*65.65*	*88.75*	*88.75*	*88.75*	......	......	......	......
St. Louis ‡c	**42.00**	**42.00**	**42.50**	**40.50**	**41.50**	**43.00**	**56.00**	*67.00*	*67.00*	78.00	77.00	13.90	16.95
San Francisco d	*32.00*	*31.00*	*32.00*	*33.50*	*33.00*	*33.50*	*33.50*	*32.00*	*32.00*	......	......	7.30g	8.90g
Seattle	*35.00*	*35.00*	*35.00*	*35.00*	*35.00*	*35.00*	*40.00*	*40.00*	*40.00*	......	......	0.00	0.00

Bold Face type, Southern Pine. *Italics, Douglas Fir.* [1] Long leaf. [2] Roofers' N. C. Pine. [3] Spruce. [4] Native. [6] Western Pine, No. 3 Common. [7] Spruce. [8] Norway Pine. ‡ Delivered. *a* Yard prices. *b* Contractors discount in Minneapolis and St. Paul discontinued May 21, 1938. *c* 5M ft. or less. *d* At ship's tackle. *e* 10% discount taken off. *f* Up to 18 ft. † Plus sales tax.

NOTE: Special concrete form grade Fir Plywood, 4′ by 8′ panels, 5-ply, sanded 2 sides, water resistant glue, carload lots, delivered per 1,000 sq. ft. surface. Seattle base price on 5/8", $86.50; on 3/4", $95.30; price includes oiling and sealing charges. For other centers add rail freight increment from table or proper size. For resin dipped treatment, add $10.50 per M. *Many mills out of market due to rush of defense orders. *g* Lower rate by water shipment. *h* 50,000 lb. minimum

GLASS, EXPLOSIVES, CHEMICALS

WINDOW GLASS: Discounts from jobbers list, Aug. 15, 1938. Single or Double Thickness

EXPLOSIVES: Per lb. 40% Ammonia Gelatin in 50-lb. cases delivered in 200 lb. lots*

	Window Glass A quality	Window Glass B quality	Explosives
Atlanta	75%	75%	$0.15
Baltimore	79%	80%	.15
Birmingham	75%	75%	.105
Boston	78%	79%	.15
Chicago	79%	79%	.15
Cincinnati	77%	77%	.15
Cleveland	77%	77%	.19
Dallas	78%	78%	.1625
Denver	77%	77%	.155e
Detroit	79–10%	79–10%	.15
Kansas City	77–10%	77–10%	.155
Los Angeles	86%d	88%d	.1575
Minneapolis	76%	76%	.155
Montreal	40–10%‡	50–5%‡	.155†
New Orleans	70%	75%	.16
New York	81%	82%	.22f
Philadelphia	82–10%d	83–10%d	.15
Pittsburgh	79%	79%	.1225
St. Louis	77–10%	77–10%	.155
San Francisco	78%d	83%d	.155
Seattle	75%	76%	.1575†

Price of 60% Ammonia Gelatin is $0.01 per lb. higher than 40%

a Disc. from list Sept. 1939. *b* Also less 6% tax exemption. *d* Discount from jobbers' list Sept. 15, 1928. ‡ Plus sales tax.

* Urban prices influenced by service charges or local storage and delivery regulations, do not consistently reflect quantity prices in less congested areas. *e* F.o.b. Louviers, Colo. *f* In boroughs of Kings, Queens and Richmond, and in Manhattan south of Canal Street, add delivery charge of $6.00 per trip. † F.o.b.

40% Ammonia Gelatin price ranges in other than urban areas, per lb. (except Seismograph Grades)

	C/L 20,000 lb. net	Tons	200 lb. lots
E. of the Miss., except Fla. and Me.	$0.105	$0.13	$0.15
W. of Miss. to Rocky Mtn. States, Fla. and Maine	.11 –.1175	.135 –.1475	.155 –.1675
Rocky Mtn. States	.11 –.1225	.135 –.1525‡	.155 –.1725‡
Pacific N. W. States	.1075–.12	.1375–.15	.1575–.17
Pacific S. W. States	.1050–.1150	.135 –.145	.155 –.165

‡F.o.b. Louviers, Colo., or Butte, Mont.

PILES, TIES—F.O.B.

PILES

Prices per linear foot, pine, with bark on, f.o.b. New York; delivered from barge 1½ to 2c. per ft. additional:

Dimensions	Points	Length	Short Leaf Barge	Short Leaf Rail
12 in. at butt	6 in.	30 to 50 ft.	$0.22	$0.195
12 in.— 2 ft. from butt	6 in.	50 to 59 ft.	.26	.24
12 in.— 2 ft. from butt	6 in.	60 to 69 ft.	.28	.255
14 in.— 2 ft. from butt	6 in.	50 to 69 ft.	.30	.265
14 in.— 2 ft. from butt	6 in.	70 to 79 ft.	.36	.275
14 in.— 2 ft. from butt	5 in.	80 to 85 ft.	.42	.415
14 in.— 2 ft. from butt	5 in.	85 to 89 ft.	.45	.482

RAILWAY TIES

Prices f.o.b., per tie for carload lots:		6"x8"x8′		7"x9"x8′6"	
		Untr.	Tr.	Untr.	Tr.
Boston	Oak	$1.30	....	$1.80	....
	Pine	1.60	$2.40a	2.40	$3.40a
New York	S. L. Sap Pine	1.30/1.40	2.05	1.60	2.55
	Mixed Oak	1.55	2.05	2.00	2.65
Birmingham	White Oak	.85	1.50a	1.35	1.70a
	Southern Pine	.55b	1.10ab	.70	1.30a
Chicago	Oak	....	1.65a	....	2.25a
	Southern Pine	....	1.53a	....	2.13a
Los Angeles	Douglas Fir	.64	1.38a	.90	1.80a
Philadelphia	Red Oak	1.10	....	....	2.40a
St. Louis*	White Oak	1.40	....	1.75	....
	Red Oak	1.40	1.85a	1.75	2.35a
	Sap Pine or Cypress	1.30	....	1.65	....
San Francisco	Douglas Fir	1.00bef	....	....	2.45caf
Montreal	Birch or Maple	.65	1.05a	.75	1.35a

Tr.— Treated; Untr.— Untreated. *a* Creosoted. *b* 6" x 8" x 8′6". *c* Empty cell. *d* Zinc. *e* Green. *f* At ships tackle. *August prices; none later quoted.

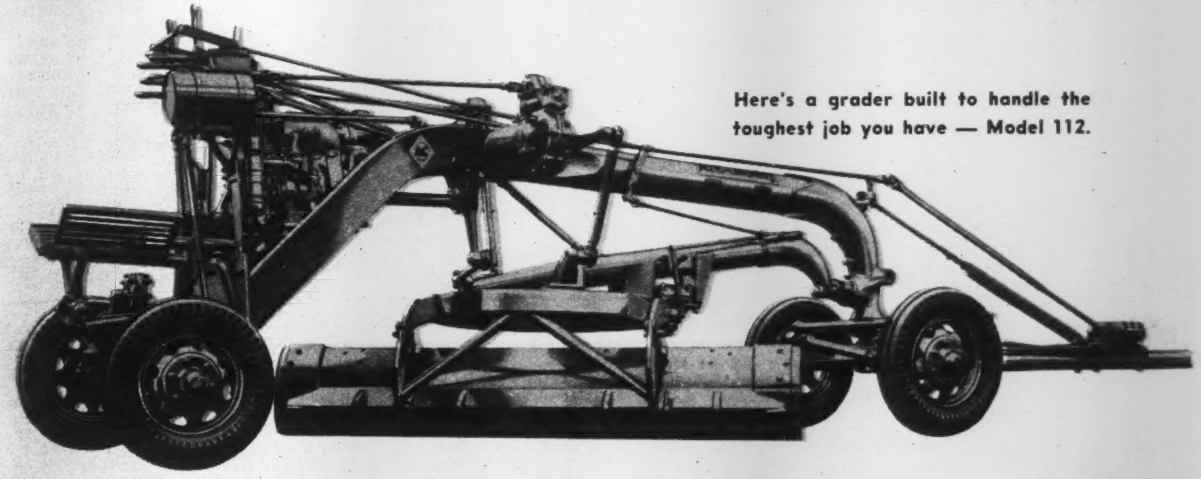
CHEMICALS

Water, sewage treatment, road work, f.o.b. carlots, New York

Bleaching powder, in drums, f.o.b. works, per 100-lb	$2.00–2.85
Chlorine cylinders, liquid, per lb. delivered	.0525
Calcium chloride, 77–80%, flaked, in 400-lb. drums or 100-lb. moisture proof bags, delivered, per ton	20.50–35.00
Silicate of soda, 52 deg., in drums, f.o.b. works, per 100 lb	1.40
Soda ash, 58%, in paper bags, per 100 lb. dense	1.10
Sulphate of aluminum, commercial, in 100-lb. bags, per ton	23.00
Sulphate of copper, in bbl., per 100-lb	5.00–5.50

Quick DELIVERY!

ALLIS-CHALMERS LEANING FRAME GRADERS — *Available Now!*



Here's a grader built to handle the toughest job you have — Model 112.

Here the Leaning Frame Grader roots up old ground and then smooths out surface on an airport project, Buffalo, N. Y.

Leaning Frame gives greater stability — enables you to cling tightly to your work on steep banks.

Why hold up your grading work? Use pull-type graders — Allis-Chalmers Leaning Frame Graders. They'll do everything a motor grader can do . . . and take on other work a motor grader can't touch. They'll go through any grading job . . . faster, with less effort, at lower cost than any other pull-type outfit. They're NEW! They're MODERN! They're AVAILABLE!

Introduced only a few years ago, Leaning Frame Graders are already making dirt-moving history . . . on the toughest kind of work — from rough grading to finishing . . . on leveling and clearing. Leaning Frame doubles the grader's efficiency — gives you extra pressure for taking deeper bites . . . a wider blade range . . . greater stability . . . more operating comfort. Slopes are always uniform—operator need only keep his platform level and blade automatically cuts straight and true. Strong . . . simple construction . . . power controlled! Advantage after advantage . . . all described in the Leaning Frame Grader catalog! Write for your copy. See your Allis-Chalmers dealer . . . NOW!

No matter how tough the job, you get it done quicker with this all-'round grader.

Model WK tractor and the 110 grader slope a bank for Wise County, Bridgeport, Texas.

Double Your Tractor Use!

Work both ends of your tractors — use them as bulldozers and with Leaning Frame Graders. Get twice as much work out of your investment.

ALLIS-CHALMERS

TRACTOR DIVISION — MILWAUKEE, U.S.A.

Write for free, descriptive Leaning Frame Grader catalog . . . NOW!

STRUCTURAL CLAY BUILDING TILE, BRICK AND LIME—DELIVERED

	STRUCTURAL CLAY TILE — PARTITION — SCORED Per M. lots of 2,000 pieces or over,			STRUCTURAL CLAY TILE — LOAD BEARING — SCORED Per M. lots of 2,000 pieces or over,			BRICK Per M. in quantity.		LIME		
	3x12x12 in.	4x12x12 in.	8x12x12 in.	8x12x12 in.	10x12x12 in.	12x12x12 in.	Common backing	Straight hard	Per ton, Hydrated finishing	In paper, Common hydrated	Carload lot, Pulverized or lump
Atlanta	$100.00	$110.00	$195.00	$230.00	$240.00	$240.00	$13.00	$18.00	$26.50	$17.00	$17.00
Baltimore	80.00	85.00	160.00	190.00	240.00	295.00	14.00*k*	17.00*k*	19.00	17.00	2.75*m*
Birmingham	80.00	85.00	160.00	191.00	252.00	288.00	14.50	17.00	18.11	13.64	2.25*o*
Boston	118.25*a*	126.40*a*	235.50*a*	......	......	......	18.00*i*	21.00*i*	19.00	14.00	2.65*p*
Chicago	68.10	72.60	135.90	185.70	234.90	268.10	11.50	12.50	16.40	14.40	12.20
Cincinnati	65.55	69.90	131.20	148.70	210.35	240.45	17.50	17.50	15.40	12.90	......
Cleveland	55.50	60.00	112.50	135.00	182.00	209.00	16.00	16.00	15.75*j*	14.50*j*	3.00*jm*
Dallas	52.00	54.00	100.00	135.00	200.00	263.00	11.50*i*	13.50*i*	19.00	15.00	.95*n*
Denver	84.80	94.40	152.70	178.20	212.00	227.90	13.50	17.00	30.00*j*	19.00*j*	30.00*j*
Detroit	69.00	73.60	138.00	176.00	232.00	265.00*e*	16.50	17.00	16.50	13.90	14.90
Kansas City	64.50	66.50	86.00*c*	125.50	159.75	186.25	15.50	24.00	19.10	12.80	10.70
Los Angeles	73.50†*r*	89.50†*r*	128.00*c*†*r*	210.00†*r*	368.00†*r*	460.00†*r*	13.50	15.00	16.50	17.50	17.50
Minneapolis	89.35	85.70	168.45	192.85	176.20	245.20	13.10	15.10*g*	21.00	16.00	19.00
Montreal	72.20*au*	77.50*au*	142.50*au*	76.00*atu*	165.80*au*	248.70*u*	17.50†*u*	24.25†*u*	23.20*u*	17.00*u*	12.00*u*
New Orleans	72.00	72.00	135.00	162.00	210.00	260.00	14.00	......	18.30	12.08	14.10
New York	78.40	83.60	115.00*c*	193.30*h*	238.80*h*	295.60*h*	13.00	......	19.00	14.00	17.00
Philadelphia	80.50	85.90	161.10	193.30	238.80	295.60	17.00*s*	19.00*s*	15.70*l*	10.05*q*	12.05*q*
Pittsburgh	62.35	66.55	124.75	140.25	173.25	198.00	17.50	19.50	17.90	15.40	2.55*m*
St. Louis	64.00	90.00	125.00	180.00	234.00	280.00	17.00	18.00	22.00	16.00	2.30*lm*
San Francisco	84.00	94.50	225.00	......	......	......	14.00	17.00	.75*o*	2.05*o*	16.40
Seattle	100.00	110.00	220.00	......	......	......	17.50*f*	22.00*f*	20.00*s*	20.00*s*	20.00*s*

† F.o.b. *a* Smooth. *b* Carload lots delivered to job. *c* 6x12x12 in. *d* Not load bearing. *e* 48 lb. tile. *f* Less $1.00, ½ cash 15 days, balance 30 days. *g* Selected common. *h* F.o.b. Perth Amboy, N. J. *i* 50c. per M. off for cash. *j* LCL. *k* $1.00 discount if paid in 10 days. *l* Lump. *m* Per bbl., 180 lb *n* Per sack 100 lb. *o* Per bbl., 200 lb. *p* 280 lb. bag. *q* 25-ton cars. *r* 5% discount 10 days. *s* 2% off cash. *t* 5¼ x 8 x 12. *u* Plus 8% sales tax.

PAINT, ROOFING—F.O.B. CARLOAD LOTS

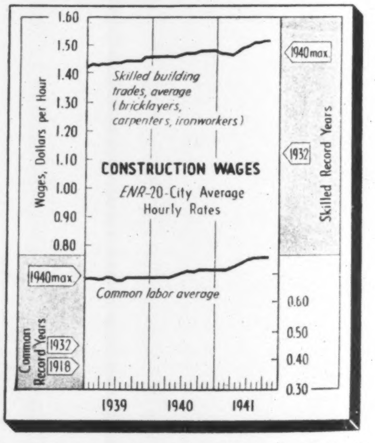
	RED LEAD Per 100 lb. in 600-lb. (Approx.) bbl.	WHITE LEAD	READY-MIXED PAINT Per gal., drums			ROOFING SUPPLIES Carload lots f.o.b. factory				
	Dry *a*	Per 100 lb. in oil	Graphite *b*	Aluminum *c*	Ferric Oxide *d*	Rolls, slate surfaced, 85-90 lb. per sq.	Asphalt felt, per 100 lb.	Tar felt, per 100 lb.	Asphalt coating per gal.	Tar pitch 350 lb. bbl. per ton
Atlanta	$9.50	$13.625	$1.30	$2.25	$1.20	$1.90	$1.61	$1.61	$0.27	$29.00
Baltimore	9.25	13.25	1.95	2.90	2.50	2.80	3.50	3.50	.80	2.75*m*
Birmingham	9.50	13.625	2.35	3.50	1.85	2.15	1.58	1.58	.32	27.00
Boston	9.25	13.25	2.25‡	2.70‡	2.00‡	2.02‡	1.85*h*‡	1.85*h*‡	.50‡	20.00‡
Chicago	9.25	13.25	2.11	2.63	1.72	1.48*hf*	1.50*hf*	1.50*hf*	.26*f*	22.00*f*
Cincinnati	9.25	13.25	1.70	2.90	1.60	2.40	2.39*h*	2.39*h*	.36	21.00
Cleveland	9.25	13.25	2.50	3.10	1.90	1.84	1.58*h*	1.58*h*	.38	21.00
Dallas	9.25	14.00	1.88	2.11*n*	....	2.50*h*	2.60*h*	2.70*h*	.50	34.00
Denver	9.75	13.75	1.65	2.60	.27*l*	2.45	4.00	3.00	.35	28.00
Detroit	9.25	13.25	1.75	3.00	1.45	2.40	2.50	2.50	.35	26.00
Kansas City	9.25	13.275	2.39*g*	2.16*g*	1.82*gn*	1.93	2.09	2.09	.25	25.00
Los Angeles	9.50	13.75	1.60	2.25	2.30	2.10	1.50	....	.45	.....
Minneapolis	9.25	13.375	....	....	....	1.84*i*	1.58*hi*	1.58*hi*	.29	21.00
Montreal *p*	9.25	9.00	2.40	2.97	2.51	2.64	1.85	1.86	.63	1.85*k*
New York	9.25	13.25	2.03	2.55	1.64	2.01	1.75*h*	1.75*h*	.23	24.00
Philadelphia	9.25	13.25	....	....	....	2.27*e*	1.94*he*	1.94*he*	.41*e*	22.00
Pittsburgh	9.25	13.25	1.05	1.95	.80	1.95	1.94*h*	1.94*h*	.34	26.00
St. Louis	9.25	13.25	1.90/2.00	2.60/2.80	1.60/2.00	1.92	1.91	1.58	.32	23.00
San Francisco	9.50	13.50	1.80	2.75*n*	1.10/2.00	1.65	2.26	2.26	.28	17.00
Seattle	9.50	13.75	1.80	2.60	....	1.67	1.18*h*	1.75	.35	28.00*j*

‡ Delivered. Note: Red lead in oil 50c. higher than white lead in oil. *a* Red lead prices change frequently due to pig lead price changes. *b* U. S. War Dept. Spec. 3-49A. *c* ASTM Spec. D266-31. *d* 80% minimum ferric oxide. *e* Subject to 25% discount. *f* Distributors' price to contractors. *g* 5 gal. can. *h* Per roll, 65 lb. *i* Minneapolis and vicinity. *j* Asphalt pitch. *k* Per 100 lb *l* Per lb. *m* Per bbl. *n* May price, no later quotation available. *p* Plus 8% sales tax.

SKILLED AND COMMON WAGE RATES—PER HOUR

	Bricklayers	Carpenters	Struct. Iron Workers	Hoisting Engineers	Plasterers	Common Labor	
						Building	Heavy Const.
Atlanta	$1.375	$1.00	$1.375	$1.00/1.25	$1.25	$0.40	$0.50
Baltimore	1.625	1.375	1.65	1.65	1.50	.70	.70
Birmingham	1.50	1.125	1.50	1.50	1.50	.50	.45
Boston	1.50	1.25	1.50	1.625	1.625	.85	.85
Chicago	1.70	1.625	1.70	1.70	1.70	1.025	1.025
Cincinnati	1.625	1.50	1.55	1.325/1.525	1.625	.75	.75
Cleveland	1.75	1.50	1.75	1.75	1.75	1.00	1.00
Dallas	1.50	1.00	1.25	1.00	1.50	.50/.625	.50/.625
Denver	1.65*b*	1.43*b*	1.43*b*	1.43*b*	1.50*b*	.718*b*	.718*b*
Detroit	1.60	1.40	1.75	1.625	1.675	.80	80
Kansas City	1.625	1.375	1.50	1.50	1.575	.85	50
Los Angeles	1.375	1.10	1.375	1.375	1.50	.655	.655
Minneapolis	1.50	1.25	1.50	1.40	1.50*e*	.90	90
New Orleans	1.50	1.25	1.50	1.375	1.375	.55	.55
New York	2.00*b*	1.85*b*	2.00	2.00*b*	2.00*c*	1.031	.95
Philadelphia	1.65*b*	1.40	1.65	1.50	1.75	.70	.70
Pittsburgh	1.90	1.50	1.75	1.25	1.75	.80	.70
St. Louis	1.25/1.50	1.50	1.75	1.50/2.00	1.25/1.75	.675/.875	.875
San Francisco	1.75*c*	1.375	1.60	1.50	1.667*c*	.85/.875	.85/.875
Seattle	1.65	1.35	1.55	1.50	1.65	.95	1.00
Montreal	.92	.81	.87	.76	.90	.53	.46

b 7 hr. day. *c* 6 hr. day. *d* 35 hr. wk. *e* 30 hr. wk.



ENR Skilled Average: (Bricklayers, Carpenters, Ironworkers) $1.516
ENR Common Average: $0.761

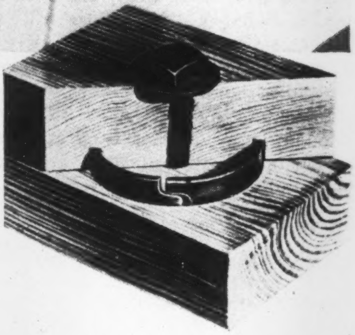
SPEED AND ECONOMY Were Demanded

That's why *Prefabricated Timber* trusses were used!

Faced with a demand for rapid, low-cost construction of a carton factory for the California Container Corporation, the designers decided on timber trusses, prefabricated with TECO Connectors.

These trusses were prefabricated, assembled, and erected on a high-speed building schedule that even the most advanced engineering skill would find difficult to achieve with any other type of material.

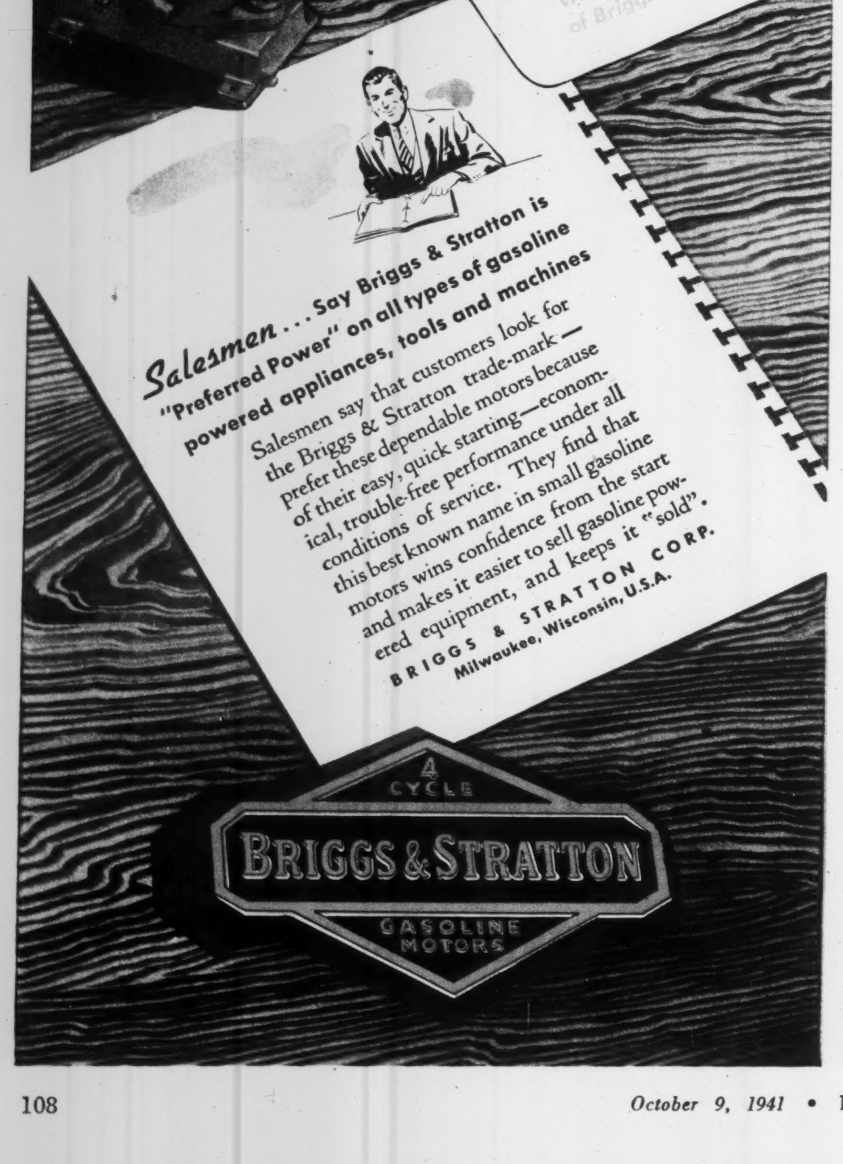
Modern engineers and builders are finding that the TECO Connector System of prefabricated timber construction is enabling them to meet building budgets and emergency schedules with a precision never before thought possible.



Write for Literature

TIMBER ENGINEERING COMPANY, Inc.

Dept. L-10, 1337 Connecticut Ave. Washington, D. C.



MILKING MACHINES
CONCRETE MIXERS
PUMP JACKS
These Are But a Few of the Wide Range of Applications of Briggs & Stratton Motors
4 CYCLE
BRIGGS & STRATTON
GASOLINE MOTORS

Salesmen . . . Say Briggs & Stratton is "Preferred Power" on all types of gasoline powered appliances, tools and machines

Salesmen say that customers look for the Briggs & Stratton trade-mark — prefer these dependable motors because of their easy, quick starting—economical, trouble-free performance under all conditions of service. They find that this best known name in small gasoline motors wins confidence from the start and makes it easier to sell gasoline powered equipment, and keeps it "sold".

BRIGGS & STRATTON CORP.
Milwaukee, Wisconsin, U.S.A.

MEN AND JOBS

W. E. Medlin, superintendent of construction for the Ellis & Cline Construction Co. for the past eight years, is now superintendent of streets at Greensboro, N. C. Mr. Medlin, recently supervising concrete runway construction at Pope Field, Fort Bragg, will succeed Ray **Warren,** who has resigned to become executive director of the Greensboro Housing Authority.

George B. Houston, assistant superintendent of streets at Tucson, Ariz., has added duties now as city traffic engineer. He will work under City Manager **Phil J. Martin, Jr.**

E. T. McLaren has been appointed city engineer of Brantford, Ont. to succeed the late F. P. Adams. Mr. McLaren has recently been in charge of airport construction at Burtch, Ont.

Joe Kuffler, city engineer at Parsons, Kan., has resigned to work as engineer on the ordnance plant now under construction at that city.

Robert W. Beck, manager of the Grays Harbor public utility district at Aberdeen, Wash. since January 1940, has resigned to resume private practice as head of the Seattle engineering firm of R. W. Beck, James I. Metcalf & Associates.

Jack Atco, operation and maintenance engineer for an irrigation project at Ontario, Oregon since 1932, has been named office engineer for the Bureau of Reclamation on the Anderson Ranch Dam project in Idaho. See *ENR* Aug. 21, 1941, p. 256 for details of the Anderson Ranch project.

O. L. Kipp, head of the construction department of the Minnesota State Highway Department since 1921 and assistant chief engineer since 1939, has been appointed planning engineer. He will continue as assistant chief engineer and will be in charge of planning, highway location and design. **C. L. Methven,** assistant construction engineer since 1929, stationed at St. Paul, has been appointed construction engineer to take over highway building activities from the time of contract awards.

Whitworth Cotten is now city engineer at Petersburg, Va., having succeeded **J. M. Hatchett,** now city manager.

W. W. Horner has resigned as professor of municipal and sanitary engineering at Washington University, St.

EMERGENCY REQUEST

MEMO FROM GENERAL MANAGER'S OFFICE

E. G. R. — Let's send this to all rope users. E. W. B.

ELLIS W BREWSTER

★ Special Sales Bulletin ★ ★

EVERYONE KNOWS THERE'S A WAR ABROAD. In fact, two wars—a "shooting" war and an economic war. We are all, in one way or another, affected by them and we are being called on to make, cheerfully, any sacrifice that helps the common cause.

THE SPIRIT in which we accept necessary changes on automobiles, hosiery, refrigerators, and many other products, *including rope*, may help to write a different history story for our children.

FOR EXAMPLE — The basic raw material for our best rope is Manila fiber, which comes from the Philippine Islands. There is no shortage of this fiber on the Islands, but there is a shortage of ships to bring it to us. So the American Rope Industry has been asked to conserve present stocks and future deliveries of Manila rope for national defense.

FOR OVER 117 years Plymouth has made fine Manila rope. Today, we are the world's largest manufacturers of this strongest, safest, and most enduring of all ropes.

THE UNITED STATES GOVERNMENT in order to conserve Manila fiber has specified the manufacture of an emergency grade of rope (presumably for the duration of the emergency). Government orders require that the emergency grade is to be supplied to all users of rope except in certain specified fields.

TO MEET these Government regulations, our Research Laboratory has developed an emergency grade of rope containing the maximum amount of Manila fiber allowable. Our manufacturing experience of 117 years will be exercised in the production of this product. It will be a rope manufactured with the maximum amount of Manila fiber permissible under these government regulations. The actual tensile strength will be about 75% of Plymouth Ship Brand Manila Rope.

50/50

ONE OF THE ENGINEERS in our plant suggested that we call this emergency grade of rope "Plymouth 50-50 Rope"—frankly, we like it, because it symbolizes the 50-50 spirit of cooperation required for successful relations between our salesmen, distributors, dealers and customers, and government.

That spirit of cooperation, so typical of America, will exist long after the need to make "50-50 Rope" has disappeared.

WRITE FOR FREE PLYMOUTH SERVICE BOOK NO. 1. Many new problems will confront you, the rope dealer or user. To help you determine where Plymouth Ship Brand Manila rope can still be used and where "50-50 Brand" must be adopted during the emergency, we have prepared a Service Manual. Write for this helpful hand book.

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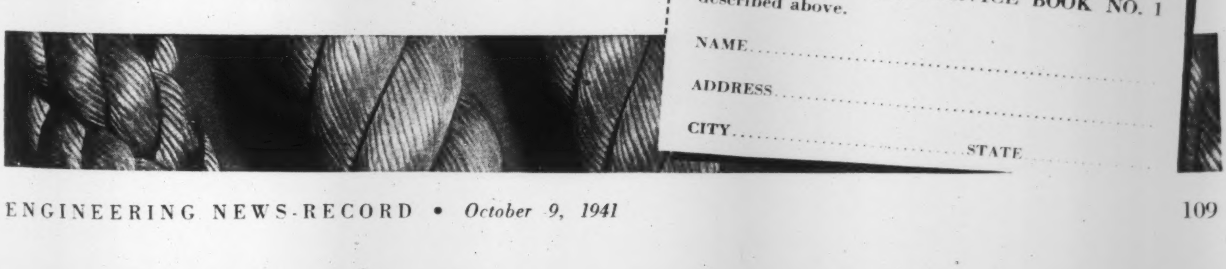

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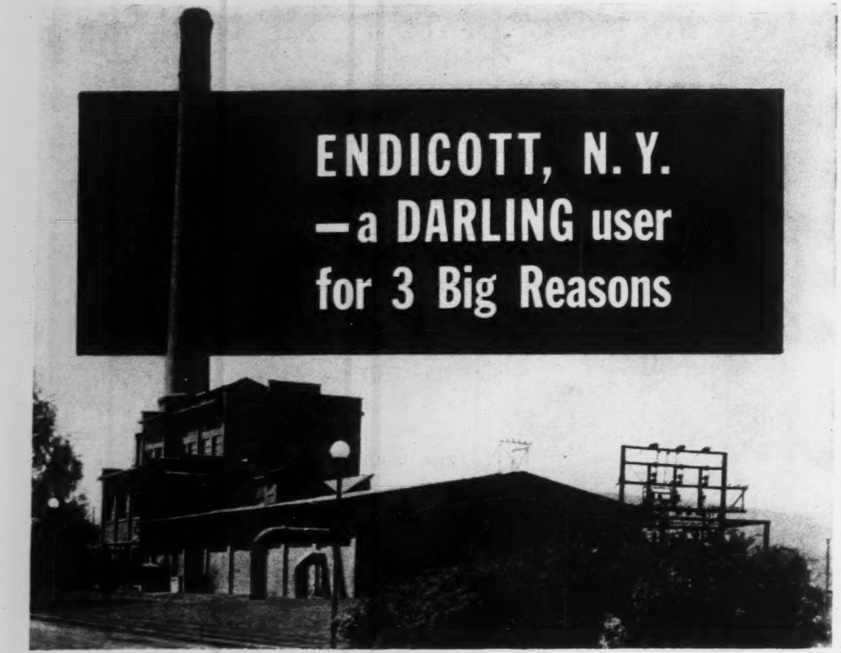
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Mr. E. J. Grippen, Superintendent of Endicott Water Works Co., writes that he prefers Darling Hydrants for three outstanding reasons:

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In Endicott, as elsewhere, Darling's "dense-metal" construction produces the trouble-free performance that gladdens the heart of any waterworks man. From the unique Darling design, with its smooth curves and uniform sections . . . through careful foundry technique, accurate molding, proper gating and heading . . . every step in Darling manufacture aims at a smooth, close structure. Dense metal, we call it—and it gives you long life, easy operation, and attractively low figures in maintenance costs. Specify Darlings for your next installation.

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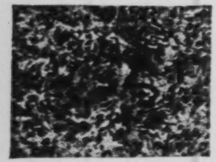
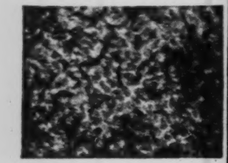
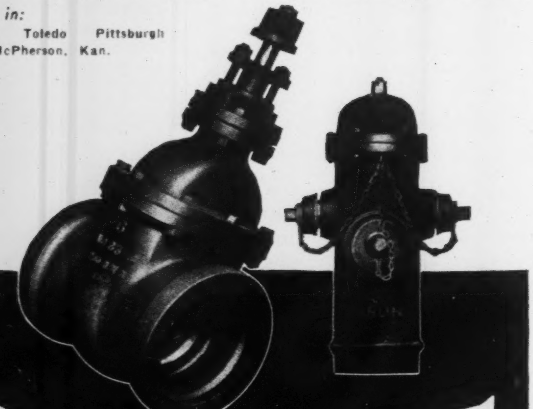

Photomicrograph (mag. 100x) showing the structure of a typical sample of cast iron as ordinarily produced. Note the entrained inclusions tending to break down the strength of the metal and produce leaks.


Showing the structure of Darling Dense Metal gray iron. In this dense, fine, homogeneous grain structure the shrinkage porosity has been minimized, with resultant pressure tightness, strength and better resistance to abrasion and corrosion.


DARLING
DENSE-METAL
GATE VALVES and HYDRANTS

Louis, to devote his time primarily to consulting work with the firm of Horner & Shifrin, St. Louis. He will continue a limited affiliation with Washington University as lecturer in hydraulics, hydrology, water supply, general municipal engineering, and related subjects.

H. M. Armstrong, of Fredericton, N. B. and a member of the New Brunswick public works department engineering staff, is in charge of official tests for members of the Civilian Volunteer Corps, a war organization.

Edwin H. Kreimann, engineer with Allis-Chalmers Mfg. Co., Milwaukee, has been appointed superintendent of utilities, including water supply and electricity, for the city of Fennimore, Wis. Mr. Kreimann is a graduate of the University of Wisconsin.

Weldon Howell, of Camden, Tenn., is now superintendent of the Paris, Tenn. water and electric system, succeeding **John Sweeney.** Mr. Sweeney has gone to Trinidad to act as operation manager on airbase work.

The following officers of the Civil Engineer Corps, U. S. Naval Reserve, have been called to active duty:

Lt. Comdr. Charles L. Pool, chief engineer, State Department of Health, Providence, R. I., at the Naval Operating Base, Norfolk, Va.

Lt. Comdr. Lionel C. Tschudy, construction engineer, U. S. Dept. of Agriculture, Amarillo, Texas, in the Eighth Naval District, New Orleans, La.

Lt. Thomas E. Ferneau, resident engineer, State Division of Highways of California, San Rafael, Calif., at the Naval Operating Base, Norfolk, Va.

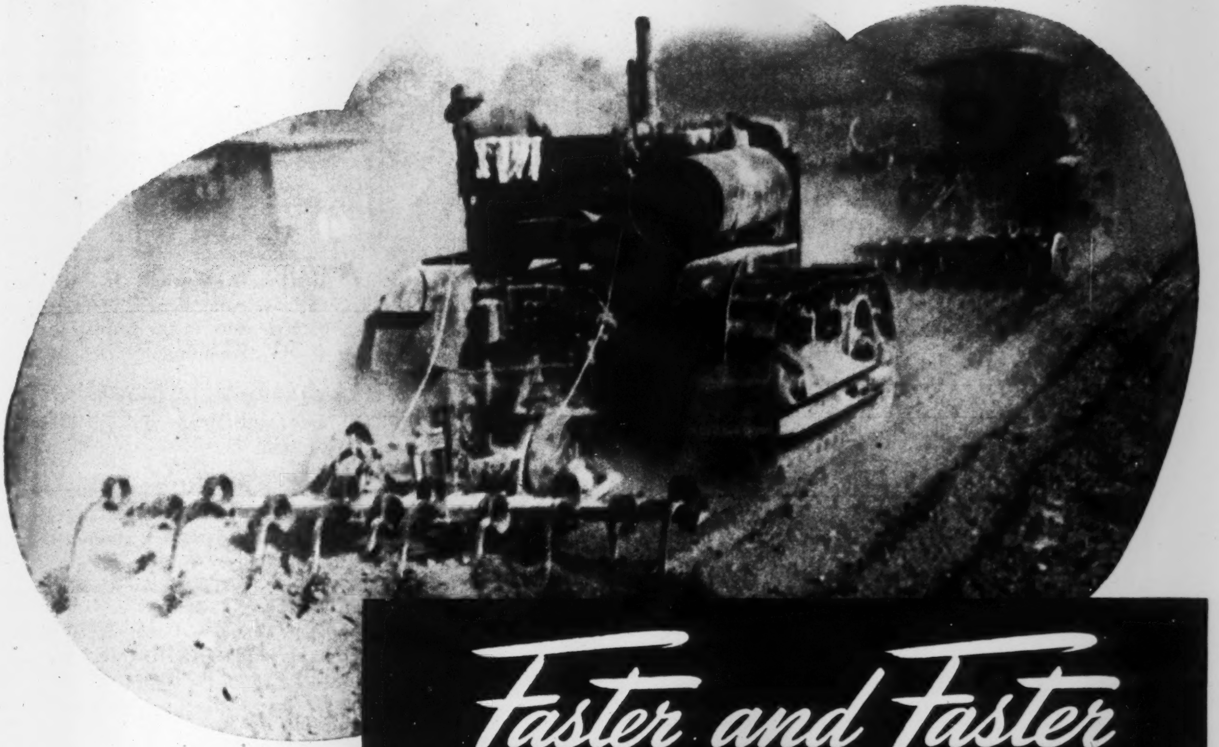
Lt. Edward H. Gessner, civil engineer of New Orleans, at the U. S. Naval Air Station, Alameda, Calif.

Lt. Harry W. Poole, civilian engineer for the Navy on power plant construction at the Boston Navy Yard, at the Naval Air Station, Quonset Point, R. I.

Lt. John E. Revelle, engineer with the Chicago Bridge and Iron Works, Chicago, at the Bureau of Yards and Docks, Washington, D. C.

Lt. John D. Burky, assistant engineer with the Bureau of Reclamation, Caldwell, Idaho, in the Fourth Naval District, Philadelphia, Pa.

Lt. R. D. Thorson, associate bridge engineer, State Division of Highways, bridge department, Los Angeles, Cal., in the office of the Supervisor of Shipbuilding.



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Now comes word of 17,938 sq. yds. placed in a single day of 21 hours with one double crew at U. S. Flying School Airport No. 6, Albany, Ga., 12-14,000 yards on many days (Hardaway Contracting Co.).

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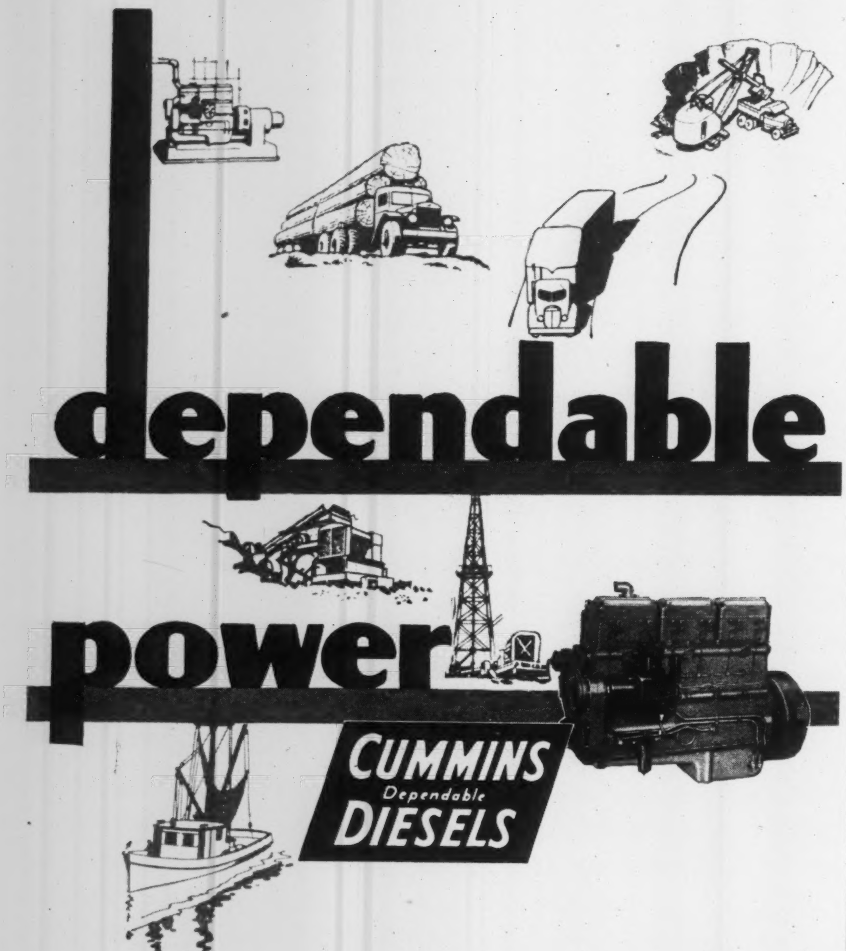

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Los Angeles Shipbuilding and Dry Dock Corp., San Pedro, Cal.

Lt. Raymond E. Flint, field and office engineer for Frazier-Davis Construction Co., Mahopac, N. Y., at the Naval Operating Base, Guantanamo Bay, Cuba.

Lt. Henry F. Hormann, assistant division engineer, Consolidated Edison Co., Brooklyn, N. Y., in the Bureau of Yards and Docks, Washington, D. C.

Lt. Gustave G. Werner, Jr., field engineer for Malcolm Pirnie, New York, N. Y., to active duty in the Bureau of Yards and Docks, Washington, D. C.

Lt. T. J. DuMont, engineer for St. Joseph County, South Bend, Ind., at the Naval Air Station, Quonset Point, R. I.

Lt. W. J. H. Nelson, junior engineer for the Bureau of Reclamation, Denver, Colo., at the Naval Air Station, Quonset Point, R. I.

Ensign John T. Gibbons, assistant bridge engineer, Chicago, Great Western R.R., Wilmette, Ill., at the Naval Air Station, Quonset Point, R. I.

Lt. Floyd L. Bollen, associate engineer, PWA, Nebraska Hydro-Elec. Projects, Kearney, Neb., at the Naval Operating Base, Norfolk, Va.

Lt. Henry W. Bressler, engineer, U. S. Housing Authority, Silver Springs, Md., in the Bureau of Yards and Docks, Washington, D. C.

Lt. William S. LaLonde, Jr., professor of civil engineering, Newark College of Engineering, Newark, N. J., in the New York Navy Yard, Brooklyn, N. Y.

Lt. Robert B. Morris, associate engineer, War Department, Washington, D. C., at the Naval Station, Key West, Fla.

Lt. William W. Studdert, civil engineer with the Texas-New Mexico Pipe Line Co., Midland, Texas, at the Naval Operating Base, Norfolk, Va.

Lt. James G. Crooks, construction engineer, Bethlehem Steel Co., Cleveland, Ohio, in the Bureau of Yards and Docks, Washington, D. C.

Lt. Glenn L. Enke, associate bridge engineer with the State Division of Highways, Sacramento, Cal., to active duty in the Bureau of Yards and Docks, Washington, D. C.

Lt. William K. Van Zandt, distribution engineer, Houston, Tex. Water Works, at the Navy Yard, Philadelphia, Pa.

Ensign William W. Olmstead, inspection engineer, Atlantic Mutual Insurance

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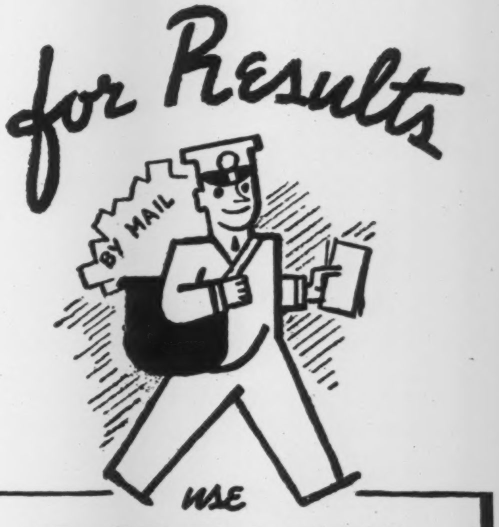

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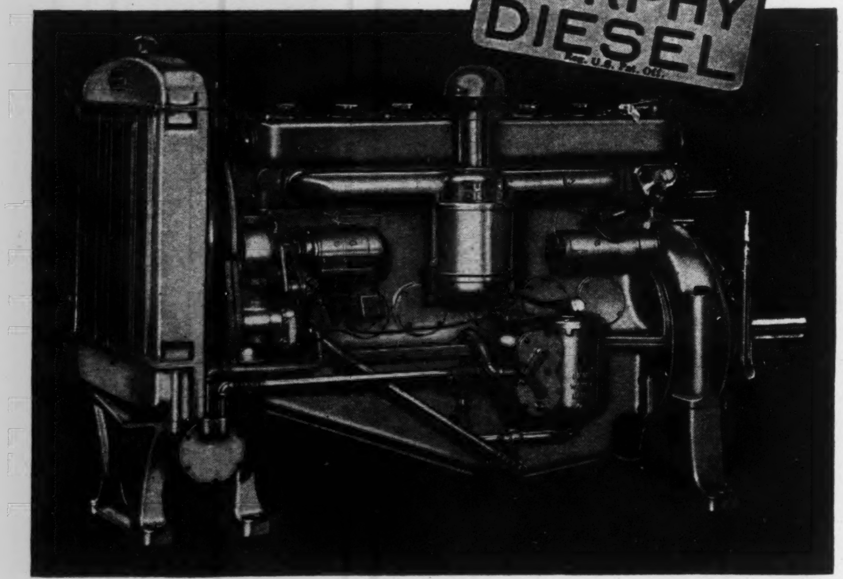
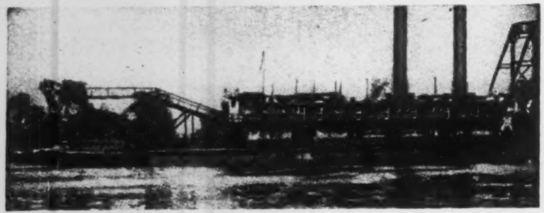


DREDGING



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Co., New York, N. Y., at Headquarters, Fourth Naval District, Philadelphia, Pa.

Ensign Richard L. Steiner, assistant project planner, USHA, Washington, D. C., at the Naval Air Station, Jacksonville, Fla.

Melvin E. Lutz, engineer at Canton, Ohio, for the past 25 years, has joined H. K. Ferguson Co., Cleveland and New York, to supervise construction of 700 "igloos" for munitions storage at the $5,000,000 Milan, Tenn. ordnance depot. He was recently in charge of a defense plant at Akron, which has been completed. Mr. Lutz will make his home at Bruceton, Tenn.

William E. Wheeler, assistant engineer with the Bureau of Reclamation at the Denver office, is now working on the Spangler Dam of the Mann Creek project at Weiser, Idaho. Mr. Wheeler was in the design section at the Denver office and in his new work will be office engineer for the Spangler Dam project.

Clifford S. Strike, West Hartford, Conn., has been elected president of F. H. McGraw & Co., Hartford, Conn. Other changes in the McGraw firm include: **F. H. McGraw** of Middletown, Ohio, former president of the firm, now chairman of the board of directors; **Rodman B. Doremus,** Greenwich, Conn. and **J. Metz McGraw,** Hartford, new vice presidents.

Arthur B. Morrill, engineer of sewage treatment with the city of Detroit, Mich., has been granted a year's leave of absence to supervise camp sanitation along the Burma Road in China. Mr. Morrill, who will leave this month for China, will be employed by the United States Public Health Service and will be senior sanitary engineer with the Burma-Yunnan Railway Medical Commission.

Tennessee Valley Authority personnel changes include **John A. Howe,** engineer in the structural design section, resigning to join Stone & Webster; **Thomas Gordon** of the cost section, also resigning to accept outside employment; and **A. O. Babb,** cost engineer at Fort Loudoun Dam and formerly at Cherokee Dam and in the central construction office at Knoxville, joining the Navy Department at Washington, D. C. Babb also worked with Stone & Webster at Grafton Dam in West Virginia.

George C. Ernst, former assistant professor of civil engineering at the University of Maryland, this fall began similar duties at Syracuse University. Professor Ernst, a graduate of the University of Michigan, has taught at Iowa State College, where he also was en-

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—President Roosevelt

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gaged in research work for the Iowa Engineering Experiment Station. In 1936 he went to the University of Maryland, where from 1937 to the present time he has been assistant professor of civil engineering.

W. H. Blake, who has served 36 years with the Canadian army, now holds the rank of lieutenant colonel and has been appointed district engineer officer for Military District No. 4. He succeeds **Maj. F. A. McGiverin.**

Luther Bearden, of Lake Village, Ark., has new duties as district highway engineer for the Arkansas State Highway Commission at Batesville, Ark. He succeeds the late J. B. Stokes.

James L. Land, Montgomery, Ala., for many years materials engineer in the Alabama highway department, and connected with that organization since 1912, has been named principal engineer in charge of the grading and paving section for the airport division, U. S. Engineers, Birmingham. He has been granted a leave of absence from the highway department.

Ben E. Torpen, consulting engineer in the U. S. Engineer Department on the Bonneville project, has been appointed chief of the general engineering division, Portland District, U. S. Engineer Corps. Mr. Torpen, who will work under **Lt. Col. C. R. Moore,** district engineer, succeeds **Maj. Paul D. Berrigan,** who has been transferred to Dallas, Tex. Mr. Torpen has been assistant to Maj. Berrigan during the past two years and in his new position will direct all flood control work and military construction projects in the Portland district.

Nicholas Monaco has resigned as senior engineer in the Montclair, N. J. department of public works to join Frederick R. Harris, Inc., New York consulting engineers. Mr. Monaco, who has been with the Montclair department for four years, is a Rensselaer Polytechnic Institute graduate.

Frank J. Kish, associate engineer on construction of the Watts Bar Dam, has been transferred to field engineer on construction at the Apalachia Dam powerhouse work, Farner, Tenn.

Floyd Ellis, engineer of Knox County, Ohio, has been granted a 90 day leave of absence to assist in relocating railroads into Pittsburgh's expanding steel mill area. He will work for the Pittsburgh & Lake Erie R.R.

Don Schliessmann, civil engineer in the materials and testing laboratory of

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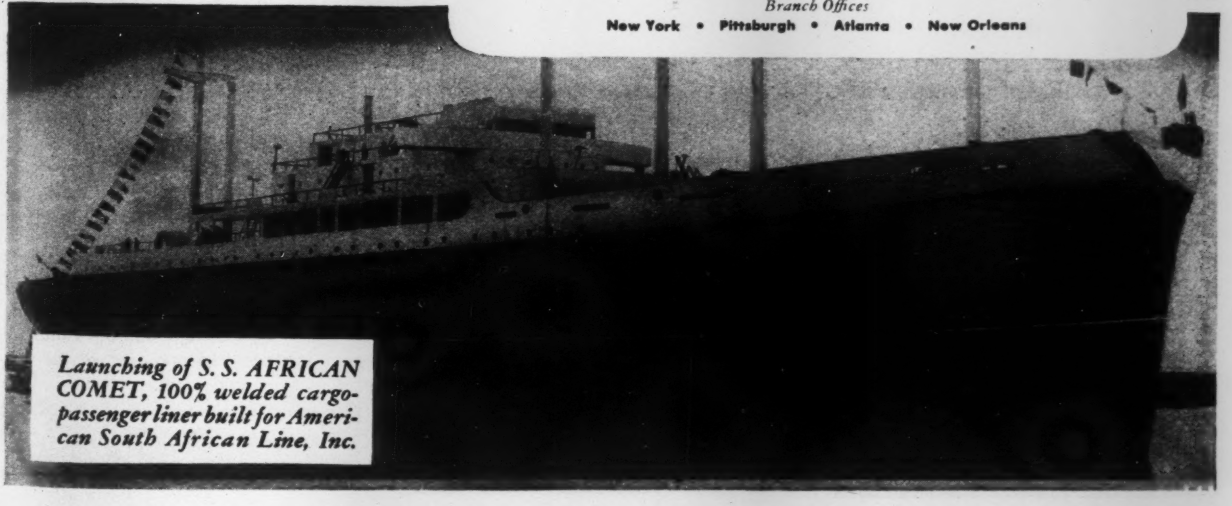

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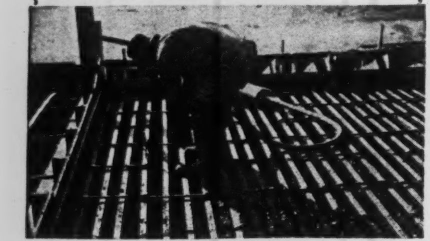

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ELIZABETH·N·J·

the Illinois highway department at East St. Louis, has received a civil service appointment with the U. S. Public Health Service at Washington, D. C.

Royal W. Ellis, of Sioux Falls, S. D., has accepted a position as draftsman with the South Dakota Statewide Highway Planning Survey at Pierre.

Howard M. Hayes, resident engineer with Harza Engineering Co. on the Santee-Cooper Project near Charleston, S. C., has resigned to accept the position of chief civil engineer with Ford, Bacon & Davis on the eastern division of the Baton Rouge-Greensboro Plantation Pipe Line contract. Mr. Hayes was formerly with the Tennessee Valley Authority for several years. He was graduated from North Carolina State College.

Lieut. David E. Graham, an engineering graduate of Iowa State college in 1938, has been appointed a military department instructor at that school. Receiving his reserve officer's commission at graduation, Lieut. Graham spent a year in active duty at Ft. Logan, Colo., and for two years has been employed as an engineer at Waterloo, Ia.

Carl Nelson, district engineer with the Illinois State Department of Public Health, with headquarters at Freeport, has been called to active military duty, and is now stationed at Fort Leonard Wood as first lieutenant in the engineering corps.

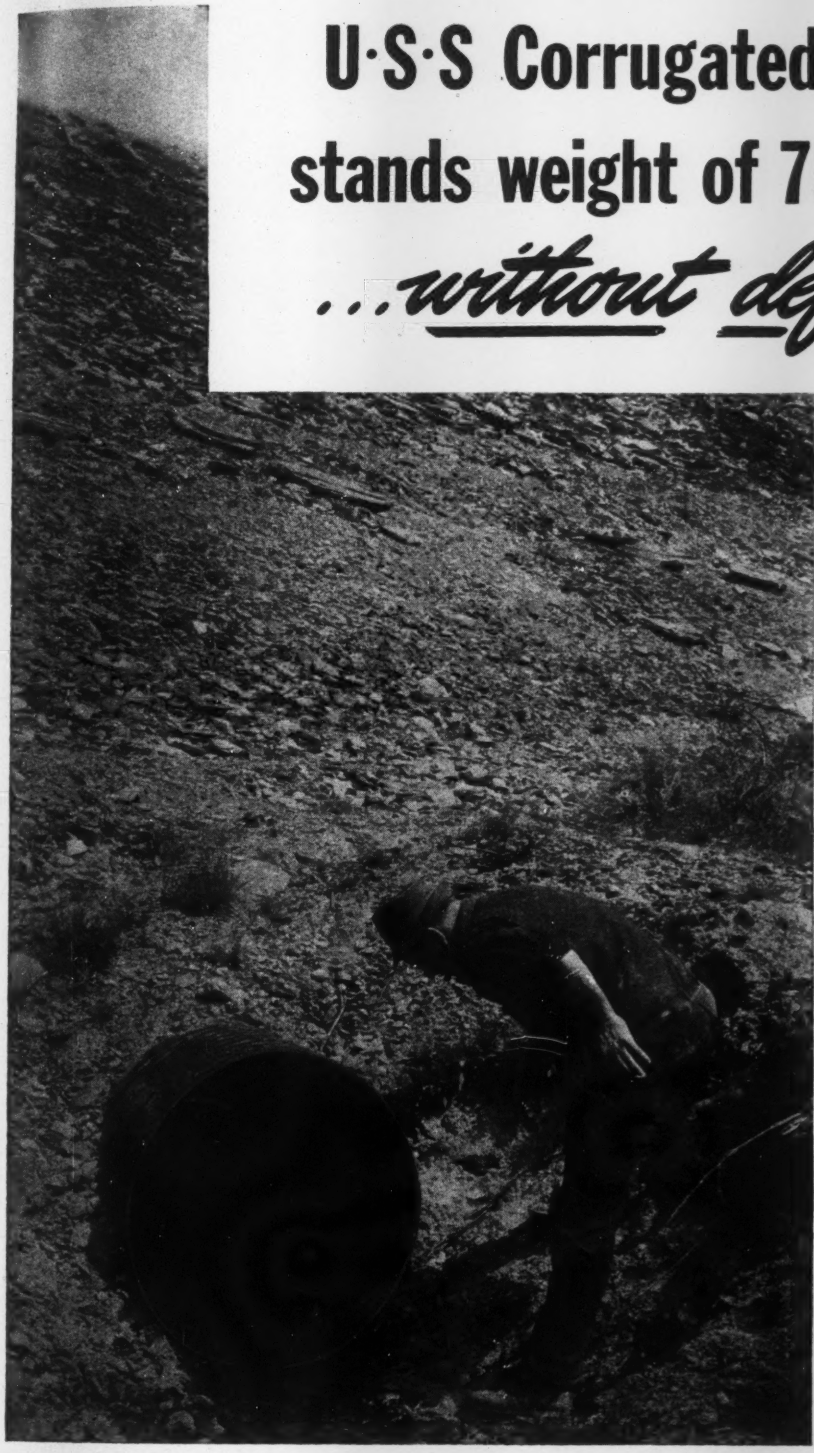
LuVerne Kirby, civil engineer with the South Dakota State Highway Commission, has received a civil service appointment with the U. S. Army Engineers and will report at a Neath Bay, Wash., project.

John J. Dorwin, civil engineer with the South Dakota State Highway Commission, has resigned to accept a position with the Bonneville Power Administration at Portland, Ore.

Lieut. Laurence Bartling, civil engineer with Sverdrup & Parcel, consulting engineers of St. Louis, Missouri, has been called to active duty with the U. S. Army and will be stationed at Fort Francis E. Warren, Cheyenne, Wyo. Mr. Bartling was formerly an engineer with the South Dakota State Highway Commission.

Max A. Mehlburger has been made an equal partner and manager of the business of the Lund Engineering Co., Little Rock, Ark., which will now operate under the firm name of Lund-Mehlburger Engineering Co. **Alfred M. Land,** another partner, is on temporary leave as

U·S·S Corrugated Culvert withstands weight of 75-foot rock fill ...*without deflection!*



THIS U·S·S Corrugated Metal Culvert is serving under a 75-foot fill near Kittanning, Pa. The fill is 1000 feet long and contains 119,177 cubic yards of rock, shale and dirt.

The culvert is 322 feet long and 36 inches in diameter. It is made of 8-gage metal, slightly oval shaped for better resistance to the tremendous weight of high fills.

Ten months after installation the culvert was thoroughly inspected from end to end. It was in perfect condition—*without deflection.* This is just one more spectacular proof of the strength of U·S·S Corrugated Metal Culverts.

You may have an installation serving under scarcely any cover. If so, here again corrugated metal can take the pounding of heaviest traffic. Because of its flexible design, it absorbs all vibration and impact with no ill effects.

Whether you are working on main or lightly traveled roads, U·S·S Corrugated Metal Culverts can do the job at low cost with complete satisfaction.

There's a fabricator of U·S·S Culverts near you. Write for his name and address.

A 75-FOOT FILL *buries this U·S·S Corrugated Metal Culvert under tons of rock and shale. There has been no deflection since it was installed more than 10 months ago.*

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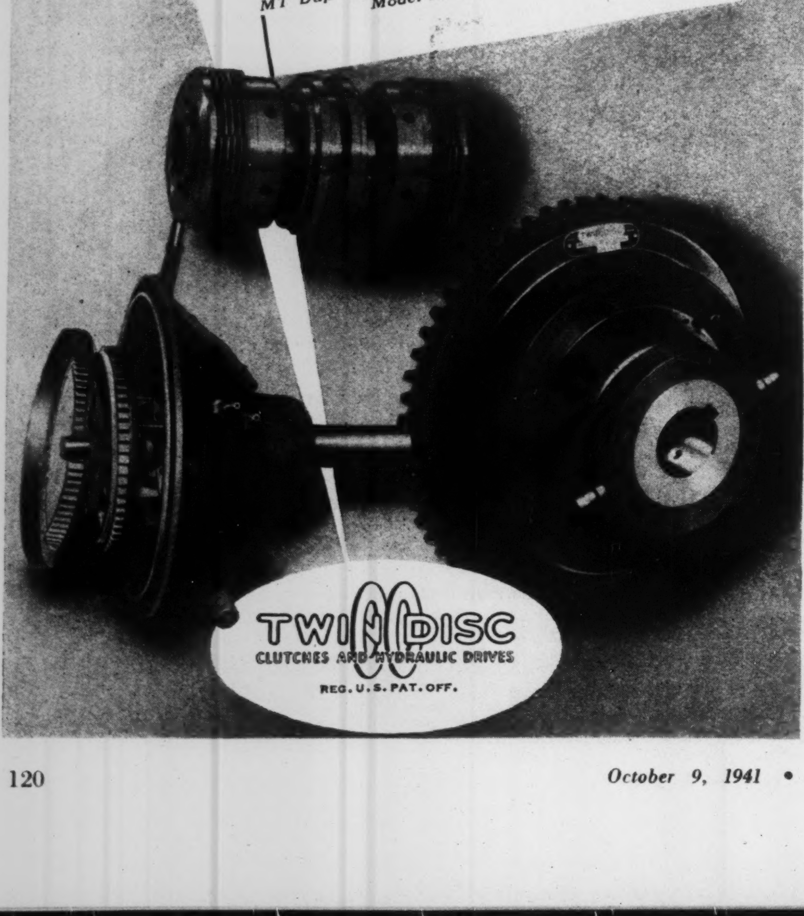
BELOW, LEFT: *Twin Disc Power Take-off.* CENTER: *Model MT Duplex Machine Tool Clutch.* RIGHT: *Twin Disc Model E Heavy-duty Clutch.*



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CLUTCHES AND HYDRAULIC DRIVES
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area manager for the Defense Contract Service, Office of Production Management, for the state of Arkansas.

Maurice Gravel, Beauport, Que., is now resident engineer with the Province of Quebec roads department at Quebec City. Mr. Gravel is a graduate in civil engineering from Ecole Polytechnique, Montreal, with the class of 1938.

Guy Beaudet, city engineer of Thetford Mines, Que., has joined the Royal Corps of Engineers as lieutenant. Mr. Beaudet is a graduate in civil engineering of the Ecole Polytechnique, Montreal.

Gerard Lajoie, graduate in civil engineering from Ecole Polytechnique, Montreal, is now in charge of construction of an intercepting sewer at Quebec City for Arthur Surveyor & Co.

J. S. A. Morissette, graduate in civil engineering from Ecole Polytechnique, Montreal, in the class of 1926, is now district engineer with the Quebec department of public roads, Quebec.

John D. Spinks, Winston-Salem, N. C., and **James W. Hewitt,** Raeford, N. C., have been appointed area engineers for the Public Works Reserve in North Carolina. Mr. Spinks, former assistant WPA Administrator in that state, will have his headquarters at Winston-Salem, while Mr. Hewitt will work out of Charlotte, N. C.

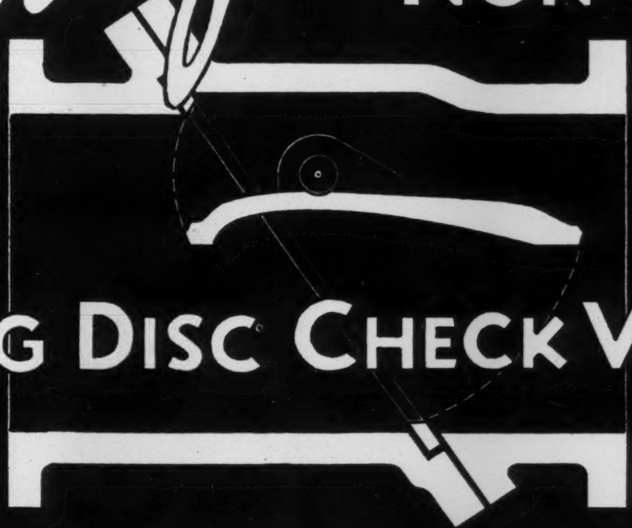
Lt. Col. Lawrence L. Simpson, constructing quartermaster at Fort Bragg, N. C. since April, 1940, is now in charge of construction at the $5,000,000 quartermaster warehouse project at Schenectady, N. Y. **Capt. Cornelius Buckum** succeeds Col. Simpson at Fort Bragg.

Lucien Delisle, civil engineering graduate of Ecole Polytechnique, Montreal, class of 1937, is now division engineer for the Quebec department of roads at Waterloo, Que.

James Oliver, civil engineer, has been employed at Arvida, Que. as construction engineer on a new filtration plant. Mr. Oliver, graduate in civil engineering from the University of Alberta in 1937, in 1939 was made layout engineer for Anglin-Norcross Ltd., Montreal, and later joined J. L. E. Price & Co. Ltd., Montreal, the firm he now represents at Arvida.

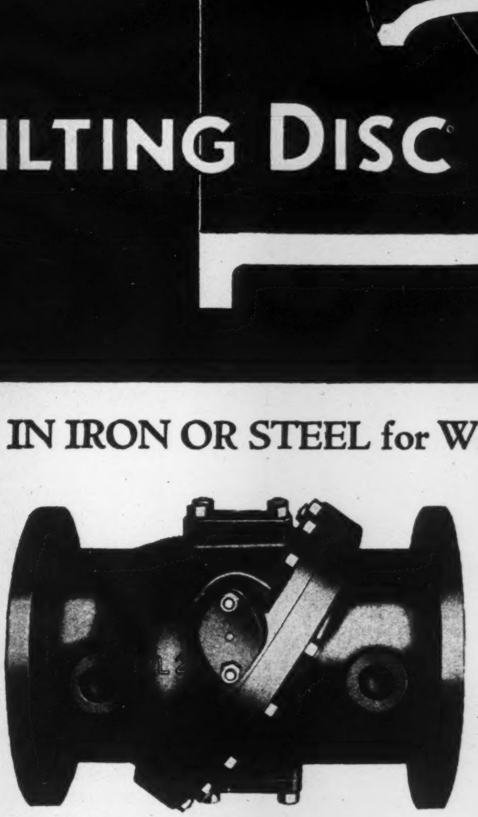
Antonio E. Vera, prominent civil engineer and railroader and former chief of the tariffs department of the Mexican Ministry of Communications and Public Works, has assumed new duties as general manager of the Southern Pacific Ry. of Mexico.

Chapman NON-SLAM



TILTING DISC CHECK VALVES

IN IRON OR STEEL for WATER, STEAM, OIL OR GAS



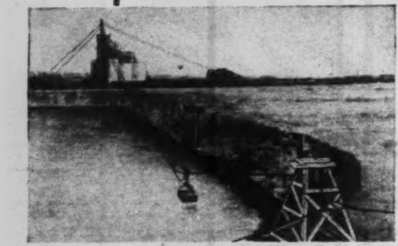
Exterior View, Chapman Non-Slam Tilting Disc Check Valve

The Chapman Tilting Disc Check Valve has many important advantages over standard swing type checks. The unique design of disc and seat gives cushioned, drop-tight closing and minimum resistance to flow when open. Slamming is eliminated. Wear on seats and hinge-pins is reduced to a minimum. Pipe line capacity is increased and head losses reduced 65 to 80%. It is made in cast iron and steel in a wide variety of sizes and pressures, and is equally efficient for use on water, steam, oil or gas.

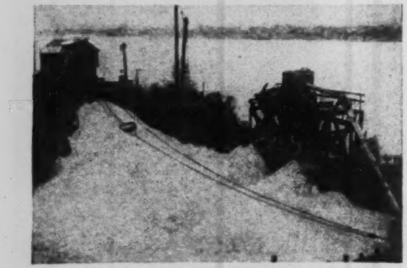
THE CHAPMAN VALVE

MANUFACTURING COMPANY
INDIAN ORCHARD, MASS.

HANDLE MORE YARDS PER $



This 2 cu. yd. Sauerman Slackline Cableway digs down to the bottom of a deep gravel deposit and hauls the material to the top of screening plant at rate of 90 cu. yd. per hour.



Small Sauerman Drag Scraper stockpiles crushed silica rock on ground alongside washery and reclaims this stored material when and as required to drying plant.

For over 30 years SAUERMAN Cableway Excavators, Power Drag Scrapers and Tower Machines have dug, moved, and placed earth, gravel, clay, blasted ore, sand, rock and coal on thousands of different jobs all over the world.

Increase your profits by taking advantage of the many economies available with SAUERMAN Machines such as: wide versatility and speed, one-man operation, extremely low power and maintenance costs, and reliable, steady service.

These machines are built in a wide range of sizes with capacities up to 1,000 tons per hour and operating spans up to 1500 ft.

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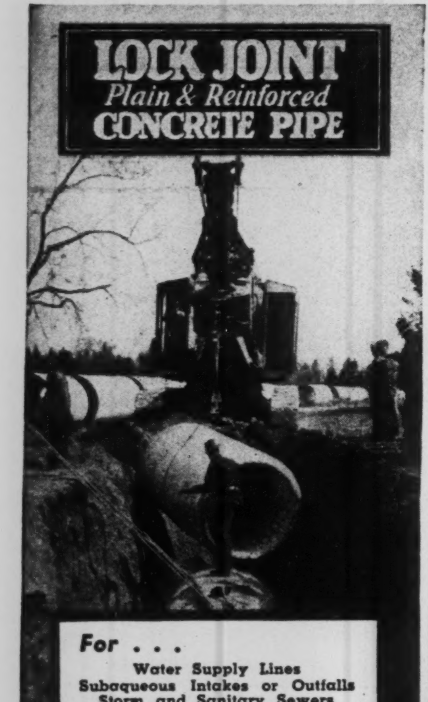
432 S. CLINTON ST., CHICAGO, U.S.A.



LOCK JOINT
Plain & Reinforced
CONCRETE PIPE

For . . .
Water Supply Lines
Subaqueous Intakes or Outfalls
Storm and Sanitary Sewers
Culverts and Drains

(See Page 103, ENR Sept. 25)

Lock Joint Pipe Co., Ampere, N. J.
Established 1905
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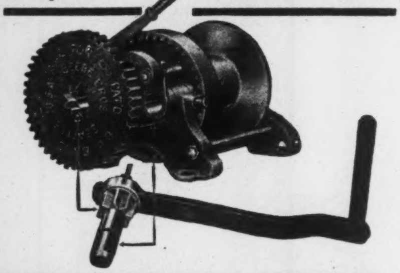
Compact! Powerful! Safe!



DISTRIBUTABLE CONTROLLED POWER

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SEATTLE, U.S.A.
TRADE MARK REGISTERED

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Money Has Been Saved on These Jobs!

1200' assembled pipe (132 Tons) were lowered to bed of Mississippi at St. Paul with 9—5-Ton Beebes, three lines to each hoist through blocks.

Hudson River Bridge sidewalks were laid in sections with 32—5-Ton Beebes.

Longest wooden trusses in world were installed with ONE 5-Ton Beebe after power hoists proved impractical.

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When raising, lowering, or placing costs by power are a serious problem, the answer is the right number of Beebe Bros. All Steel Hand Hoists MANNED IN UNISON. Available in 2, 5 and 15 Ton sizes. Sold through leading dealers in all trade centers. List of dealers sent upon request.

BEEBE BROS., 2720 6th Ave. S., Seattle, U.S.A.

★

"THE STRONGEST GEARED POWER FOR ITS WEIGHT IN THE WORLD"

MEETINGS

Federation of Sewage Works Associations, 2nd annual convention, Hotel Pennsylvania, New York, N. Y., Oct. 9–11, 1941.

Federation of Architects, Engineers, Chemists & Technicians, 6th national convention, Detroit, Mich., Oct. 10–12.

American Public Health Association, Atlantic City, N. J., Oct. 13–17, 1941.

Associated General Contractors, fall Board meeting, Book-Cadillac Hotel, Detroit, Mich., Oct. 13–15.

American Railway Bridge and Building Association, annual meeting, Stevens Hotel, Chicago, Ill., Oct. 14–16.

American Institute of Steel Construction, annual convention, The Greenbrier, White Sulphur Springs, W. Va., Oct. 14–17, 1941.

American Society of Civil Engineers, fall meeting, Palmer House, Chicago, Ill., Oct. 15–17.

Canadian Institute of Sewage & Sanitation, 8th annual convention, Walper House, Kitchener, Ont., Oct. 16–17.

American Welding Society, Bellevue-Stratford Hotel, Philadelphia, Oct. 19–24, 1941.

American Public Works Association, 47th annual conference, Roosevelt Hotel, New Orleans, La., Oct. 26–29, 1941.

National Council State Boards of Engineering Examiners, Hotel Pennsylvania, New York, N. Y., Oct. 27–30.

Industrial Hygiene Foundation, 6th annual meeting, Mellon Institute, Pittsburgh, Pa., Nov. 12–13.

REGIONAL AND LOCAL MEETINGS

Association of Western State Engineers, 14th annual convention, Westward Ho Hotel, Phoenix, Ariz., Oct. 13–14.

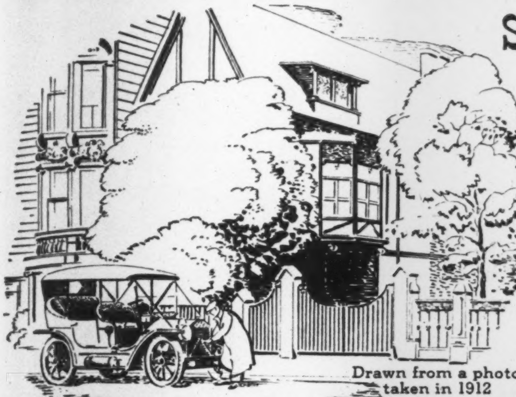
North Dakota Water & Sewage Works Conference, 13th annual meeting, Jamestown, N. D., Oct. 13–15.

Illinois Municipal League, 28th annual convention, Congress Hotel, Chicago, Ill., Oct. 15–17.

American Water Works Association, Minnesota Section, Minneapolis, Oct. 9–11; New Jersey Section, Atlantic City, N. J., Oct. 16–18.

MANY THINGS HAVE GONE SINCE 1912 BUT THIS GATE STAYS YOUNG BECAUSE

... it's Hot Dip Galvanized



Drawn from a photo taken in 1912

● Since this gate began its long, maintenance-free life, billions of dollars worth of other steel products have rusted away . . . A needless waste of money that means higher living costs for every American and a possible shortage of this metal for more vital needs . . . The obvious answer to this is Hot Dip Galvanizing—first, because zinc is the most economical rust protection known to modern science; second, because the Hot Dip Process provides a *thicker* coating of zinc; and third, because it fuses the *zinc* into the steel and makes the coating an inseparable part of the product . . . Many Hot Dip Galvanized Products are still on the job after more than 50 or 60 years of severe service . . . Patronize our members and *know* that you get a genuine, quality Hot Dip coating every time . . . AMERICAN HOT DIP GALVANIZERS ASSOCIATION, INC., American Bank Building, Pittsburgh, Pa. Write for literature.

IF IT CARRIES THIS SEAL IT'S A JOB WELL DONE

Acme Galvanizing, Inc., Milwaukee, Wis. ★ Acme Steel & Malleable Iron Works, Buffalo, N.Y. ★ American Tinning & Galvanizing Co., Erie, Pa. ★ Atlantic Stamping Co., Rochester, N.Y. ★ Atlantic Steel Co., Atlanta, Ga. ★ Buffalo Galvanizing & Tinning Works, Inc., Buffalo, N.Y. ★ Diamond Expansion Bolt Co., Inc., Garwood, N.J. ★ Equipment Steel Products Division of Union Asbestos and Rubber Co., Blue Island, Ill. ★ The Fanner Mfg. Co., Cleveland, O. ★ John Finn Metal Works, San Francisco, Cal. ★ Galvanizers Incorporated, Portland, Oregon ★ Thomas Gregory Galvanizing Works, Maspeth, N.Y. ★ Hanlon-Gregory Galvanizing Co., Pittsburgh, Pa. ★ James Hill Mfg. Co., Providence, R.I. ★ Hubbard & Co., Oakland, Cal. ★ Independent Galvanizing Co., Newark, N.J. ★ International-Stacey Corp., Columbus, O. ★ Isaacson Iron Works, Seattle, Wash. ★ Joslyn Co. of California, Los Angeles, Cal. ★ Joslyn Mfg. & Supply Co., Chicago, Ill. ★ L. O. Koven & Brother, Inc., Jersey City, N. J. ★ Lehigh Structural Steel Co., Allentown, Pa. ★ Lewis Bolt & Nut Co., Minneapolis, Minn. ★ Missouri Rolling Mill Corp., St. Louis, Mo. ★ The National Telephone Supply Co., Cleveland, O. ★ Penn Galvanizing Co., Philadelphia, Pa. ★ Riverside Foundry & Galvanizing Co., Kalamazoo, Mich. ★ San Francisco Galvanizing Works, San Francisco, Cal. ★ The Sanitary Tinning Co., Cleveland, O. ★ Standard Galvanizing Co., Chicago, Ill. ★ Wilcox, Crittenden & Company, Inc., Middletown, Conn. ★ The Witt Cornice Company, Cincinnati, O.

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GALVANIZED PRODUCTS
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HOT-DIP GALVANIZING

From our files — CASE NO. 2604. Gate at 2124 Green St., San Francisco. Galvanized for Carmen Sprague in 1912 by San Francisco Galvanizing Works.

PENCIL FOR SPEED
PEN FOR PERMANENCE

Pen or Pencil

We could have brought out a pencil cloth when we introduced Micro-Weave Tracing Cloth, but we didn't because we were not satisfied with a "just as good" product. We wanted something better, and now we have it — sufficiently better to prove itself on the drawing board. Micro-Weave Pencil Cloth is made in a new way, and it has a surface with a real pencil affinity — you try it, and you will realize how much of an understatement the word "better" is.

SAMPLES ON REQUEST
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Micro-Weave All American TRACING CLOTH

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NORWOOD, MASS.
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MORE THAN 180 FLAWLESS THREADS PER SQ. INCH

The dispensing roll container is a protection, a convenience and an identification. It keeps the cloth clean — handy brackets attach to desk or table.

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can reduce your construction costs. It is efficient and dependable, an established product.

WE RECOMMEND "GUNITE" for structural steel protection, floor and roof slabs, thin exterior walls, partitions, tanks, reservoirs, restoring disintegrated concrete surfaces, repairing reinforced concrete, etc.

Let us suggest how "Gunite" can best solve your problems.

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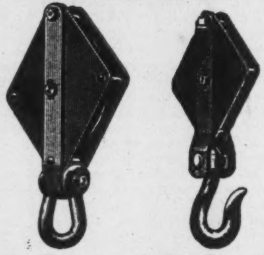
DOBBIE



Dobbie Foundry & Machine Co.
Niagara Falls, N. Y.
DERRICKS • WINCHES • SHEAVES

Missouri Society of Professional Engineers, annual meeting, Hotel Statler, St. Louis, Mo., Oct. 17–18.

West Virginia Society of Professional Engineers, Bluefield, W. Va., Oct. 23–25.

Water Pollution Conference of Interstate Commission on the Delaware River Basin, Philadelphia Section, American Society of Civil Engineers, and Engineers Club of Philadelphia, at the Engineers Club, 1317 Spruce St., Philadelphia, Friday, Oct. 24, at 1 p.m.

New York State Society of Professional Engineers, annual meeting, Hotel Niagara, Niagara Falls, N. Y., Oct. 24–25.

Water and Sewage Works Conference, 7th annual meeting, Aberdeen, S. D., Oct. 28–29, 1941.

Illinois Water Plant Operators, 9th annual fall meeting, Leland Hotel, Springfield, Ill., Oct. 28–29.

Texas Section, Am. Soc. of C. E., fall meeting, Fort Worth, Oct. 31–Nov. 1.

Engineering Society of Western Pennsylvania, annual conference, William Penn Hotel, Pittsburgh, Nov. 3–4.

North Carolina Section, American Water Works Association, High Point, N. C., Nov. 3–5.

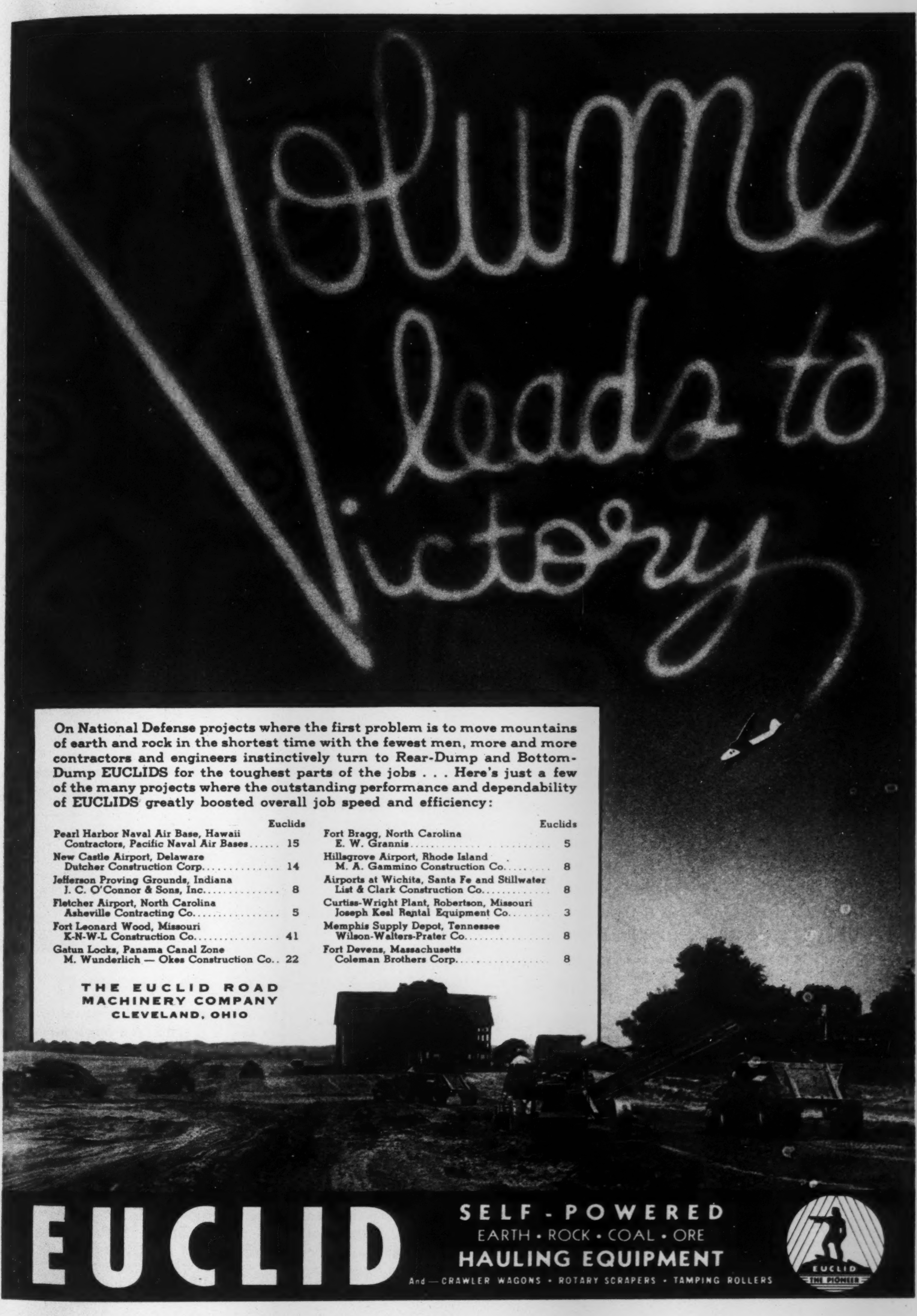
Illinois Association of Highway Engineers, 1941 convention, Abraham Lincoln Hotel, Springfield, Ill., Nov. 9.

ELECTIONS AND ACTIVITIES

At a Recent Meeting of the Montgomery, Ala., Engineers' Club the following officers were elected: F. S. Mc Fadden, president; Edward S. Beck, 1st vice-president; H. K. Francis, 2nd vice-president, and A. J. Maggio, secretary-treasurer. R. E. Rothschild is chairman of the membership committee.

H. T. Canfield Engineering Associates, a group of experienced public utility and industrial engineers, has been established with offices at 61 Broadway, New York City. The new organization will give particular attention to problems involved in the integration of utility systems and changes of ownership. Consulting engineering service will be offered on valuations, cost analyses, depreciation and rate studies and regulatory matters and proceedings.

Clyde A. Walb, of Fort Wayne, Ind., is the new president of the Indiana Society of Professional Engineers. Mr. Walb is president of the General Dredging Co., Inc., of that city. One of Mr. Walb's first duties as the new president of the society will be to help draft plans for the annual state convention of the Indiana Society of Professional Engineers.



On National Defense projects where the first problem is to move mountains of earth and rock in the shortest time with the fewest men, more and more contractors and engineers instinctively turn to Rear-Dump and Bottom-Dump EUCLIDS for the toughest parts of the jobs . . . Here's just a few of the many projects where the outstanding performance and dependability of EUCLIDS greatly boosted overall job speed and efficiency:

	Euclids
Pearl Harbor Naval Air Base, Hawaii Contractors, Pacific Naval Air Bases	15
New Castle Airport, Delaware Dutcher Construction Corp.	14
Jefferson Proving Grounds, Indiana J. C. O'Connor & Sons, Inc.	8
Fletcher Airport, North Carolina Asheville Contracting Co.	5
Fort Leonard Wood, Missouri K-N-W-L Construction Co.	41
Gatun Locks, Panama Canal Zone M. Wunderlich — Okes Construction Co.	22

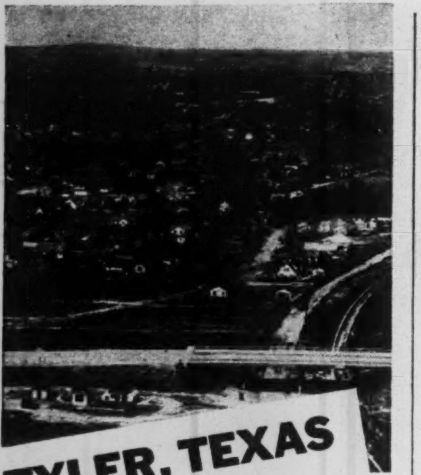
	Euclids
Fort Bragg, North Carolina E. W. Grannis	5
Hillsgrove Airport, Rhode Island M. A. Gammino Construction Co.	8
Airports at Wichita, Santa Fe and Stillwater List & Clark Construction Co.	8
Curtiss-Wright Plant, Robertson, Missouri Joseph Kesl Rental Equipment Co.	3
Memphis Supply Depot, Tennessee Wilson-Walters-Prater Co.	8
Fort Devens, Massachusetts Coleman Brothers Corp.	8

THE EUCLID ROAD MACHINERY COMPANY
CLEVELAND, OHIO

EUCLID

SELF-POWERED
EARTH • ROCK • COAL • ORE
HAULING EQUIPMENT
And — CRAWLER WAGONS • ROTARY SCRAPERS • TAMPING ROLLERS

EUCLID THE PIONEER



TYLER, TEXAS
City and Industry—
100% Layne

NUMEROUS are the cities and towns where municipal and industrial water wells and pumps are 100% Layne.
The progressive and thriving city of Tyler, Texas, is an example. The first ground water development in that area was installed by Layne in 1934. Since then all municipal and industrial well water supply and turbine pump systems have been Layne.

In meeting defense and armament project emergencies, Layne Companies have broken all records, both in the number of wells and pumps installed and in the quantity of water produced, in any like period of time. In addition to such added activity, Layne Companies have continued their service to municipal and industrial non-defense projects without appreciable delay.

Layne is unquestionably the largest and most widely experienced ground water developing organization in the Nation. Their methods have proven most successful and the number of their completed projects exceeds that of any other organization ten times and more.

Layne has the men, machinery and experience necessary to handle water development contracts of any size. Their Engineers are ready to cooperate on your plans. If you need more water, write or wire.

LAYNE & BOWLER, INC.
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LAYNE
PUMPS & WELL
WATER SYSTEMS

AFFILIATED COMPANIES

Layne-Arkansas Co.	Stuttgart, Ark.
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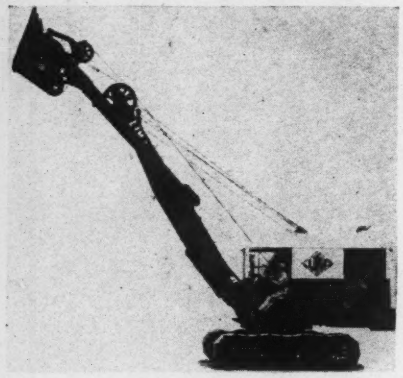
Layne-Bowler New England Corp.	Boston, Mass.
Layne-Central Co.	Memphis, Tenn.
Layne-Northern Co.	Mishawaka, Ind.
Layne-Louisiana Co.	Lake Charles, La.
Layne-New York Co.	New Cork City.
Layne-Northwest Co.	Milwaukee, Wis.
Layne-Ohio Co.	Columbus, Ohio.
Layne-Texas Co.	Houston, Texas.
Layne-Western Co.	Kansas City, Mo.
Layne-Western Co. of Minnesota	Minneapolis, Minn.
International Water Supply	London, Ontario, Can.

New Aids to the Constructor

Equipment and material announcements and manufacturers' news



New Crane Unit

The Lima Type 603 is a combination shovel, dragline and crane. When used as a shovel, it is equipped with a 21-ft. boom, 17-ft. dipper handle, and a 1½-yd. dipper. As a crane, it has a maximum lifting capacity of 25 tons. It is available with gas, diesel, oil or electric power unit. The shovel boom is of box-type design, electrically welded throughout and the dipper handle is of the same modern construction. The brakes and clutches are of extra large diameter, the latter of the inside expanding type with housing cooled through radiation fins. The hoist clutches are equipped with vacuum power assistors operating through toggles which makes possible the raising or lowering of loads with accuracy and ease without the operator losing the "feel" of the work. Each major operation is independent of the other, which makes it possible to hoist, travel, swing and raise or lower the boom simultaneously. The crawler truck is composed of a one-piece base casting with four through axles on the ends of which revolve eight open type self-cleaning rollers. The crawlers are so designed that they may be extended in length to increase the ground bearing area.—*Lima Locomotive Works, Inc., Shovel & Crane Division, Lima, Ohio.*

Emergency Electric Unit

New emergency lighting units available in capacities from 3400 to 10,000 watts are adapted to industrial plants and other uses where interruption of normal source of power may result in substantial damage. These units are used in connection with Exide battery of either the "chloride" or the flat plate type. These units have an automatic transfer switch which instantaneously transfers the battery to emergency lighting circuit upon failure of the normal a.c. supply. When the a.c. service is restored, the emergency lighting circuits are instantly transferred back to the a.c. supply. The battery is kept fully charged at all times by automatic chargers which reduce the rate to a trickle after full charge is reached. Operation and maintenance costs are low as battery life ranges from 8 to 14 years. The new units are completely described in a folder available on request.—*The Electric Storage Battery Co., Philadelphia.*

Small Reversible Motors

For use on cranes, hoists, lathes and many other industrial applications where instantaneous reversing is necessary, a new capacitor-start reversing motor is available in ratings of from 1/6 to 3/4 horsepower, single phase 60 cycle, the motor operates at 1725 rpm on 115 and 230 volt circuits. For reversing the motor has a special centrifugal-starting switch with two contacts, a solenoid relay, and a resistor, and a separate drum switch is provided. Reversing the motor is done simply by throwing the drum switch to the opposite side.—*Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.*

Cotton Quilts

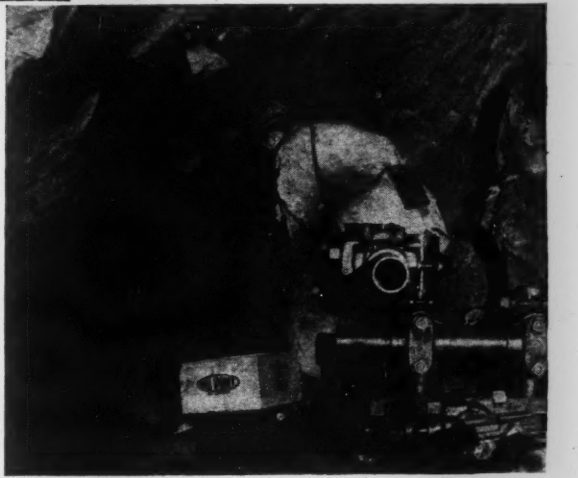
Cotton quilts for curing of concrete are now a popular and much used material. The quilts absorb and retain an enormous amount of water so that one wetting per day is sufficient for the curing process. They have the added advantage of being excellent protection from frost and cold weather, actually insulating the slabs from the weather during the curing period. During the late Fall season when temperatures are uncertain, use of this protective material is doubly profitable. National brand cotton quilts are available from—*National Automotive Fibers, Inc., Highway Materials Department, Little Falls, N. Y.*

THE BROOKLYN-BATTERY TUNNEL

ON October 28, 1940, President Roosevelt broke the ground for the Brooklyn-Battery Tunnel. Requiring an estimated six million man hours of labor over a period of four years, this will be one of the largest and most difficult engineering jobs of its kind ever undertaken in New York City. It will cost $57,000,000 and have an annual capacity of 16,000,000 vehicles. The tunnel will be constructed, under contracts, by the New York City Tunnel Authority. The illustration at the left shows how the two dual lane tubes, each 10,000 feet long, will link the circumferential highway system of Manhattan with the Belt Parkway in Brooklyn.

CONSTRUCTION DETAILS

The tunnel will consist of two cast iron tubes, 31 feet in diameter, lined with concrete. Roadways will be 21 feet in width and accommodate two lanes of traffic. Fresh air ducts will be under the roadways, exhaust ducts above. In general, the design of the tubes is practically identical to that of the Holland, Lincoln and Queens-Midtown Tunnels.



DU PONT EXPLOSIVES AT WORK

Except for about 1,000 feet at the Manhattan end and 4,000 feet at the Brooklyn end, all of the subaqueous part of the tunnel—some 5,000 feet in each tunnel—will be through rock. The only rock work done thus far was in sinking the 82-foot Manhattan construction shaft. On this, Du Pont explosives were used exclusively.

THERE'S A DU PONT EXPLOSIVE FOR EVERY EXCAVATING AND TUNNELING JOB

▶ No matter what the nature of the job, there's a Du Pont explosive available to do it effectively and economically. We will gladly assist you in selecting the proper explosives and in getting the kind of results you want on the job. E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington, Delaware.

DU PONT EXPLOSIVES *and* BLASTING ACCESSORIES

ENLISTED FOR THE DURATION OF THE HIGHWAY!

GOHI PIPE
CORRUGATED

One thing in highway construction you need have no fears about. When GOHI Corrugated Pipe is installed, it's there for keeps! It is enlisted for the duration of the highway and it will never *soldier* on the job! GOHI possesses the ability to stand up under the most severe highway conditions: heavy traffic, settling and shifting fills, alternate freezing and thawing, abrasion and corrosion. So when roads are protected by GOHI it's a safe bet that the drainage structure will outlast the road! Send for a copy of 72-page illustrated GOHI Book containing charts and tables of interest to all road builders. Write the fabricator nearest you.

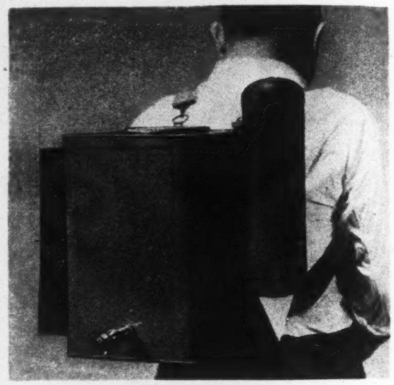
GOHI Pipe meets Copper-Bearing Pure Iron requirements in all specifications published by nationally recognized specifying authorities.

New England Bolt Co.	Everett, Mass.
Central Culvert Co.	Ottumwa, Iowa
Capital City Culvert Co.	Madison, Wis.
Bancroft & Martin Rolling Mills Co.	S. Portland, Me.
Denver Steel & Iron Works Co.	Denver, Colo.
The Lane Pipe Corporation	Bath, N. Y.
Dixie Culvert Mfg. Co.	Little Rock, Ark.
St. Paul Corrugating Co.	St. Paul, Minn.
The Newport Culvert Co.	Newport, Ky.

GOHI CULVERT MANUFACTURERS, INC.,
NEWPORT, KY.

Packaged Power Systems

Packaged, designed-for-defense, electric power systems have been developed for U.S. air bases by G.E. Planned as units, the systems have all their parts—generating equipment, load-center power units, unit substations, distribution transformers, and switchgear—coordinated electrically, mechanically and thermally in advance of installation. Experience indicates that the time normally required for designing and building a conventional system can be reduced by from 4 to 8 months through the use of the packaged units. To assure reliable functioning under warfare conditions, the systems are designed so that power continues to be supplied to unharmed parts even after one area has been damaged. Each system includes two or more regular sources of power supply, using tie-ins with outside generating facilities wherever available.—*General Electric Co., Schenectady, N. Y.*



Mobile Water Tank

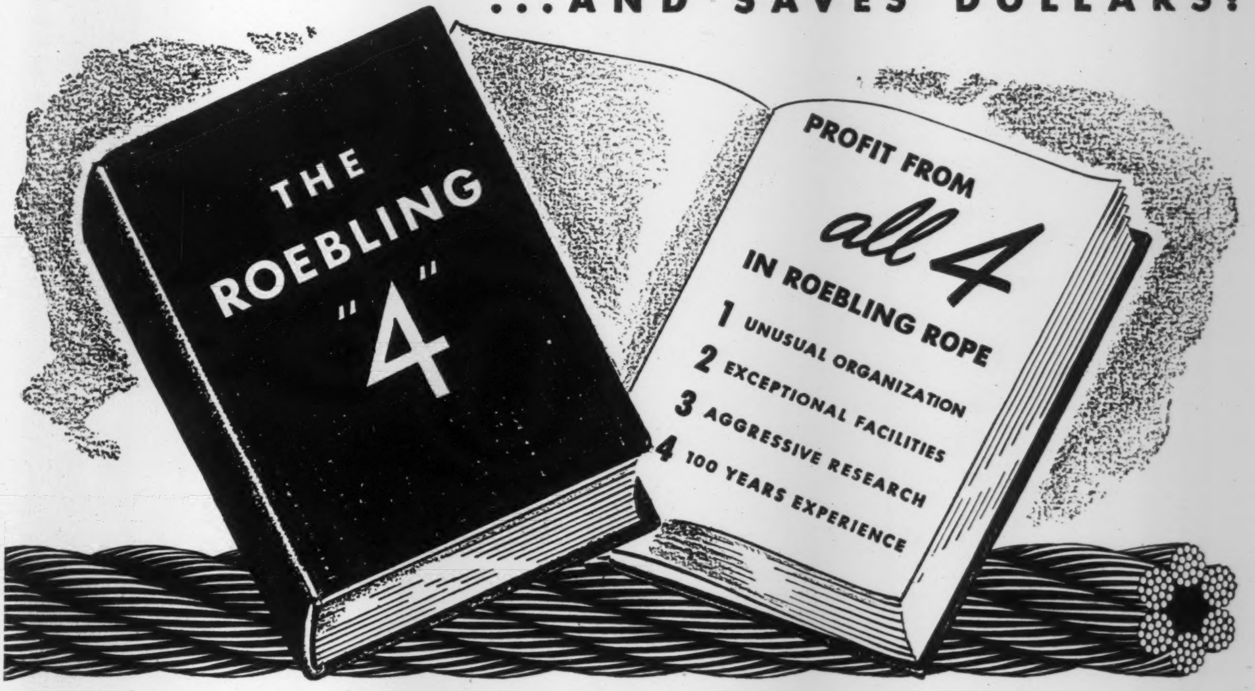
New on the market is an aid for the water boy and a help to the hygiene of a job. The water tank shown is equipped with comfortable carrying harness, a dispenser for paper cups and a waste receptacle. Total unit weighs 7 lb. and holds 5 gal. of water. Use of this outfit reduces the weight carried and speeds deliveries thus resulting in better service all over the work.—*Universal Paper Products Co., 823 S. Wabash Ave., Chicago, Ill.*

Sewer Joint Compounds

Two new sewer joint compounds have been announced by Keystone. A hot pouring compound presents a mixture of petroleum asphalt and finely ground mineral filler in a ratio designed to retain flexibility in cold weather and to prevent erosion and flow in hot weather. It may be applied by any of the common methods used to join pipe sections horizontally and is packaged in a heavy cardboard container which replaces the conventional steel drum. The package is

A WIRE ROPE STORY THAT MAKES SENSE

. . . AND SAVES DOLLARS!


THE ROEBLING "4"
PROFIT FROM
all 4
IN ROEBLING ROPE
1 UNUSUAL ORGANIZATION
2 EXCEPTIONAL FACILITIES
3 AGGRESSIVE RESEARCH
4 100 YEARS EXPERIENCE

ROEBLING

"Blue Center"
STEEL

WIRE ROPE

PREFORMED AND NON-PREFORMED

Roebling leaves no stone unturned to give you the finest in wire rope. In Roebling "Blue Center" Steel Wire Rope you get the benefit of a combination of advantages obtainable nowhere else. It's a combination we call the "Roebling 4".

Service record after service record has proved that on the basis of *general average* rope operating cost, Roebling "Blue Center" Steel Wire Rope saves money —gives unexcelled performance!

A JOB ENTRUSTED TO ROEBLING VETERANS!

Drawing the wire for Roebling "Blue Center" Steel Wire Rope is a job that calls for great skill and painstaking care.

Most Roebling wire drawers have had from 10 to 35 years of experience!

In Roebling Wire Rope you get the benefit of the extra quality built into the rope by an organization whose skill and experience is unsurpassed.

ROEBLING 1841 1941 100th ANNIVERSARY

JOHN A. ROEBLING'S SONS COMPANY TRENTON NEW JERSEY

Branches in Principal Cities   Export Division: 19 Rector St., New York, N.Y., U.S.A.   Cable Address: "Roebling's", New York

FACTS and FIGURES *that* PROVE *the* *Superiority of* BUDA HUBRON EARTH DRILLS

(NUMBER 5 OF A SERIES)

SAVED $121.28 PER DAY ON POLE LINE CONSTRUCTION

"Buda-Hubron Earth Drill has sunk 54—7 ft. x 22 in. holes in clay and gravel in 9 hours at a cost of $1.454 per hole . . . Hand methods cost $2.70 per hole . . . Earth Drill saves $121.28 per day."

— *a Midwest Utility Company.*

THE BUDA CO. • *Dept. A* • Harvey (Chicago Suburb) Ill.

Every Civil Engineer affirms to the seventy-eight year enviable reputation of the "BUFF" Instruments. "BUFF" is the *"Best in the World."*

Rental Transits — Reasonable Rates. Send for handsome new catalog #491

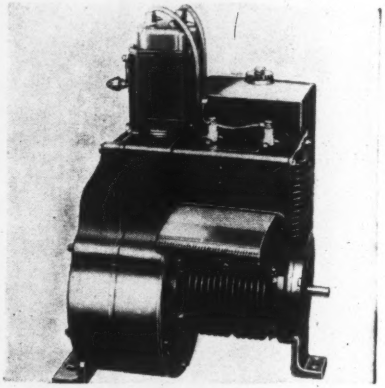
BUFF & BUFF INSTITUTE
J. P., Boston, Mass.

THE BUFF "X" TELESCOPE has the finest and highest definition and simplest lens system. It is useful when the light is dim.

HAYS GAS SERVICE
BRASS
FROM STOCK
SINCE 1869
HAYS MFG. CO., ERIE, PA.

of a size permitting its full use in the average melting pot eliminating all possibility of obtaining an improper mix between asphalt and filler.

A cold troweling type, designated Keystone Plastic Sewer Joint Compound, is designed to prevent infiltration of water into concrete and vitrified sewer pipes and to remain sufficiently plastic to take up any natural pipe settlement.—*Keystone Asphalt Products Co., 43 E. Ohio St., Chicago.*

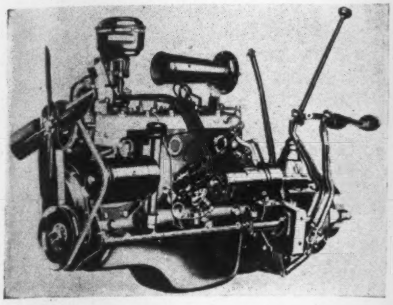


New Line of Small Engines

Three new 2-cycle, portable, air-cooled industrial engines are on the market known as the Mercury Universal Industrial Engine. They are recommended for chain saws, pumps, generator sets, fire-fighting equipment, compressors, etc. The line consists of a one-cylinder, 2½-hp. engine; a 2-cylinder, 5-hp. engine; and a 4-cylinder model to develop 10 hp. Motors can be used in either vertical or horizontal position and may be had complete with clutch, various gear ratios, and with swivel transmission. The complete 5-hp. model weighs only 65 lb. These engines have an industrial-type magneto instead of the fly-wheel type and the multi-cylinder models have individual cylinders as in high-priced airplane and industrial engines.—*Kiekhaefer Corporation, Cedarburg, Wis.*

Diesel Oil

Kendall has a new diesel oil which brings to the high speed diesel and high-output gasoline engine fields the low oil consumption and minimum engine wear that have made Pennsylvania oils famous. It is specifically fortified in its resistance to bearing corrosion, engine deposits and oil deterioration. Its addition to the Kendall line is the result of months of laboratory, engine-block and field tests with both gasoline and diesel engines under the most severe conditions. Kendall diesel oil is refined from 100% Bradford, Pa., crude, is available in S.A.E. 10 to S.A.E. 50 grades, and is dewaxed to Zero pour. To this has been added a special inhibitor which guards against bearing corrosion, sludge formation and oil deterioration. A new pamphlet gives full information.—*Kendall Refining Co., Bradford, Pa.*



Powerful Dodge Truck Engine

Embodying new, more powerful engines and numerous advancements contributing to added pulling power, speed, stamina, long life and economy, a new line of Dodge Job-Rated trucks excels, in power and efficiency of operation.

With power and torque increases unprecedented in Dodge truck history a 115 horsepower 1½-ton model shown above and a 120 horsepower 1½-ton Special are featured in a complete new line which includes 112 standard chassis and body models, on 18 different wheelbase lengths, ranging in capacities from half-ton pick-up and panel types to heavy-duty gasoline and Diesel powered prime movers. Driver comfort and safety are first consideration in design of cabs with "Safety Vision" rear window and other improvements.—*Truck Division, Dodge Brothers Corporation, Detroit.*

Conveyor Belt Repairs

The easiest and least expensive method of increasing conveyor belt life is by systematic repair of minor cover injuries as most belts fail from the cumulative effect of these minor injuries rather than from more serious accidents. The type RO round vulcanizer was developed especially for such repair work. Its 10-in. diameter, round, electrically heated platen is adequate to vulcanize practically any minor injury in one heat. It weighs 50 lb. and it is easily handled by one man. Complete instructions for use are contained in a manual

Prolong Wire Rope Life . . .
INSURE SAFETY . . . INSTALL QUICKLY
Streamline the Appearance

By Specifying

Electroline FIEGE CONNECTORS

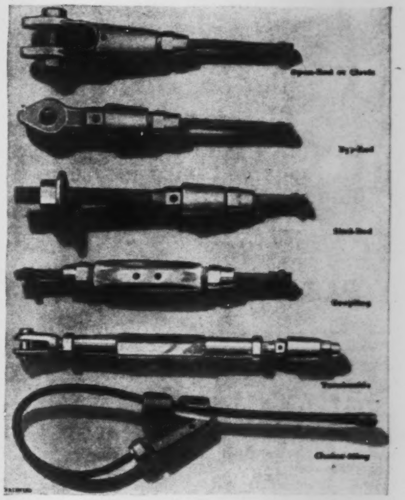
"They Hold Like a Bulldog"

WHEREVER wire rope is used, Electroline-Feige Connectors have proved their efficiency, on all types of equipment.

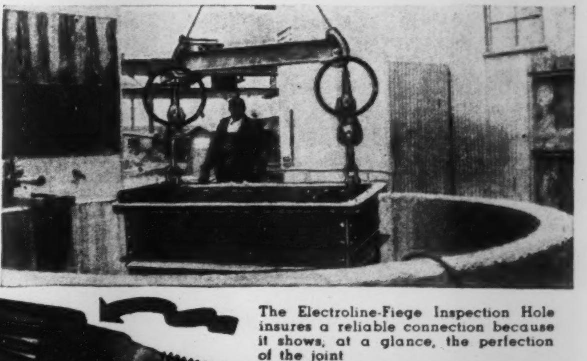
Compact and streamlined — simple and strong — easily installed, they are the first selection of experienced operators.

Their "feathered-off" compression grip greatly prolongs the life of the wire rope or steel strand to which they are attached — they are economical as well as safe.

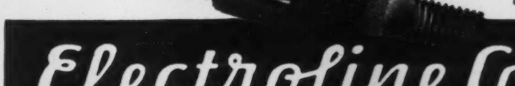
Our New Bulletin F-2 gives full specifications and performance details. Write for it.



Available in Drop Forged SAE-1040 Steel, Rope sizes ¼" and larger, in black, hot-galvanized or cadmium-plated; also, in Rope sizes ½" and smaller, in bronze, stainless steel and monel metal.



On a Water Supply Tunnel Project, the City of Chicago handles loaded cars from the bottom of the entrance shaft with Electroline-Fiege equipped cables.



The Electroline-Fiege Inspection Hole insures a reliable connection because it shows, at a glance, the perfection of the joint

Electroline Company

4121 SOUTH LA SALLE STREET • CHICAGO, ILLINOIS

SCHRAMM
THE MODERN AIR COMPRESSOR

Schramm Model No. 210 Gasoline Engine Driven Air Compressor . . . mounted on spring trailer with towing coupling and streamlined tool boxes

Write for Catalog 42-P

SCHRAMM INC., WEST CHESTER, PA.

For Perfection In
CONCRETE

"Properly Balanced"

Water-Repellant
Seal-Coat
FOR SMOOTHING
and
WATERPROOFING CONCRETE

CONCRETE DEFECTS and POROSITY
Permanently sealed leaving a perfectly smooth surface.

A positive waterproofing and smoothing compound for Topping over New or Old Concrete surfaces. Just mix with cold water and apply with ordinary paint brush over any surface wet or dry.

In 25 pound bags at 9 cents per pound. Ton quantities 7 cents per pound. F. O. B. Newark, N. J.

LARGE WORKING SAMPLE
FREE ON REQUEST.

Paint-Point Corp.
275 Passaic St., Newark, N.J.

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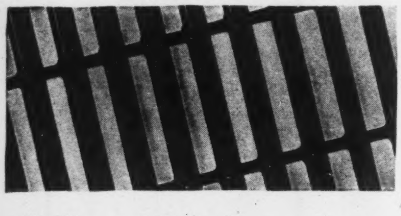
FILLET WELD



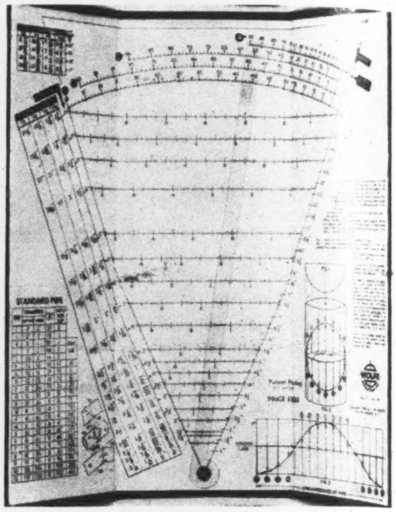
Easily maintained - - -
NO CRACKS, JOINTS, CREVICES

Batesgrates are self-cleaning because of peaked, non-skid cross bar. They have no grooves or rough burned metal to catch grease or dirt. Safe traction. Batesgrates are strictly one piece — no cuts, slots, or punching. Made from Hexagon Shaped Hot Rolled Steel Bars with smoother, larger, much stronger welds. Send today for engineering Catalog No. 937.

When you need grates
SPECIFY BATES
for long-time economy

WALTER BATES CO.
208 S. LaSalle St. Chicago, Ill.

"Direction for making Repairs used in Conveyor and Elevator Belting" which is available upon request.—*B. F. Goodrich Co., Akron, Ohio.*



Angle Meters

A practical slide rule for rapid laying out of angles on sheet metal is now available as the "Angle Meter" which is created to enable the man on the job to lay out directly on pipe or flat material. The outfit gives direct readings for any angle of bend up to 90 deg. in steps of 1 deg. on diameters from 1 in. to 20 in. but may be used for greater sizes by interpolation. Using a method of measuring in both directions from a center line, it requires only 4 measurements to mark a pipe or stretch out in 16 different points on the circumference. Layout of multi-piece bends is handled with the angle meter and a little simple arithmetic.

Also available is a Circle Meter which gives instantaneous readings of diameters and circumferences of any circle up to 72 in. in diameter in steps of ⅛ in.—*Interstate Sales Co., 1123 Broadway, New York City.*

Recorders

By glancing at the bold indicating scale of a Micromax recorder and noting the position of its black pointer, refinery operators can now see the pH of dehydrator water, can regulate the flow of ammonia or caustic for correct neutralization in the tower. Or by examining the red-ink chart record drawn by the recorder, they can see the trend of pH during the past hour, day or week. This information is available at any time for an L&N glass electrode assembly constantly detects the pH of a continuously-flowing sample of water, while the recorder continuously indicates and records the results.—*Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia, Pa.*

NEW PUBLICATIONS

Welding Products—A new bulletin, No. 941-W, describes Amsco welding products for reclamation, hard surfacing and repairing of ferrous equipment parts. A table gives the correct Amsco rods to use for proper hard facing with either the electric or acetylene method. *—American Manganese Steel Division of the American Brake Shoe & Foundry Co., 389 E. 14th St., Chicago Heights, Ill.*

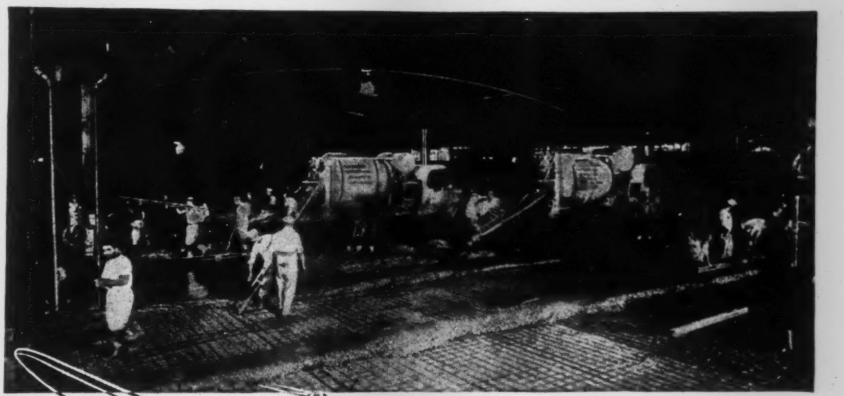
Water Treatment—A 48-page booklet of articles on scale, corrosion and water treatment problems has been reprinted from a selection of the most interesting and popular discussions to appear in the Haering house organ, H-O-H Lighthouse. The booklet provides information on water problems occurring in cooling systems, hot water systems, boilers and return systems and includes special data on corrosion inhibitors, scale preventives, protective coatings, etc.*—D. W. Haering & Co., Inc., 205 W. Wacker Drive, Chicago.*

Oil—An 8-page bulletin describes Quaker State HD oil, a new oil for heavy-duty service in trucks, buses, tractors and other motorized equipment, both gasoline and diesel engine powered.—*Quaker State Oil Refining Corp., Oil City, Penna.*

Small Shovels—Badger shovels, including attachments and conversion equipment which make them a trench hoe, skimmer, crane or dragline, are described in a new, well illustrated bulletin now ready for mailing. The pamphlet features the Badger advantage of swinging only the front of the machine, giving full three-quarter swing but reducing substantially the weight it is necessary to move.*—The Austin-Western Road Machinery Co., Aurora, Ill.*

Loaders and Conveyors—Jeffrey has three new catalogs which describe their line of portable loaders and conveyors. Catalog No. 758 is titled "Portable Belt Conveyors," catalog No. 759 is titled "Portable Bucket Loaders," and catalog No. 761 describes "Portable Scraper Conveyors." All are well illustrated and give engineering and clearance data necessary for selection of these important materials moving machines.*—Jeffrey Mfg. Co., Columbus, Ohio.*

Arc Welders—A 38-page catalog describes the complete line of Hobart simplified arc welders and accessories. *—Hobart Brothers Co., Troy, Ohio.*



PLANE HORSEPOWER . . . OR
PLAIN HORSEPOWER
YOU CAN'T HAVE THE ONE WITHOUT THE OTHER

AGAIN Waukesha Power is speeding defense construction. This time it's at East Hartford, Connecticut—helping to build Pratt & Whitney's new plant, which will soon be producing the engines to power speedy pursuit planes and powerful big bombers for our Army Air Corps.

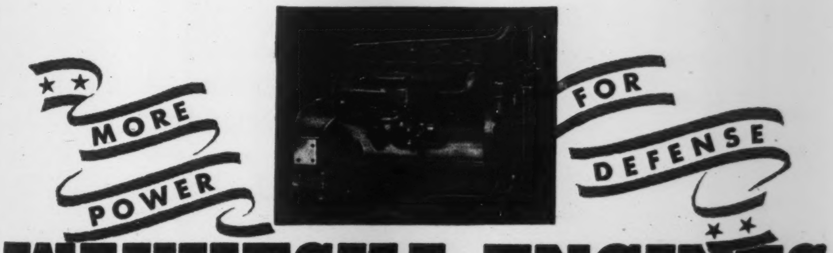
As usual Waukesha is right on the job—25-35 hp. XAHU Waukesha Engines driving the Chain Belt Moto-Mixers that are turning out the concrete for the factory floors.

Whether it's building new factory facilities to supply new weapons of defense . . . or building the roads over which they will be transported . . . or the trucks which will move them . . . Waukesha Engines play an inconspicuous but vitally important part. For it's Waukeshas that supply much of the horsepower for construction and road-building contractors' machinery of all types—and the motive power for trucks and busses.

Waukesha Gasoline and Oil Engines for Industrial, Stationary and Automotive Power range in size from 5 hp. to over 300 hp.

Bulletin 1079 is a complete catalog of every Waukesha Engine and Power Unit with ratings, speed torque, horsepower and size. Send for it today.

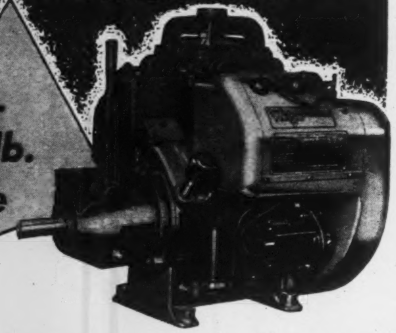
WAUKESHA MOTOR COMPANY, WAUKESHA, WIS.
NEW YORK TULSA LOS ANGELES



WAUKESHA ENGINES

Yours for HEAVY-DUTY POWER SERVICE

22 hp.
in a 285 lb.
Package



MODEL VE-4
4-cycle, 4 cylinder
V-type Engine.

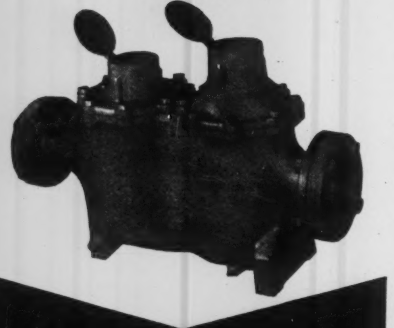
Any piece of equipment that is powered by a Wisconsin VE-4 air-cooled engine stands at the top of the list for "defense material economy", power output per lb. of engine weight, and operating dependability.

Where else can you get 22 hp. of *heavy-duty* engine power in a 285-lb. "package"? . . . always available for continuous-duty service, when and where needed.

MOST POWER PER POUND
HEAVY-DUTY AIR-COOLED ENGINES
by WISCONSIN MOTOR CORPORATION
Milwaukee, Wisconsin, U. S. A.

World's Largest Builders of Heavy-Duty Air-Cooled Engines

PITTSBURGH
ARCTIC-TROPIC
COMPOUND
METERS



FOR THE ACCURATE
MEASUREMENT OF
BOTH LARGE
AND SMALL VOLUMES

PITTSBURGH EQUITABLE METER CO.
MERCO NORDSTROM VALVE CO.
410 N. LEXINGTON AVE. PITTSBURGH, PA.

CONCRETE PIPE
FOR ALL DRAINAGE AND WATER SUPPLY PURPOSES

Either shipped to you from one of our permanent plants, or manufactured for you on the job by one of our mobile units.

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CONCRETE PIPE EQUIPMENT
FOR SALE OR LEASE

Enables engineers and contractors to manufacture pipe at distant or foreign job sites.

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CONCRETE CRIBBING

UNIVERSAL CONCRETE PIPE COMPANY
Main Office
COLUMBUS, OHIO

Plants can conveniently serve projects in: Massachusetts—Connecticut—New York—New Jersey—Pennsylvania—Ohio—West Virginia—Georgia—Florida—Michigan—Indiana—Illinois—Tennessee—Kentucky—North Carolina—South Carolina.

Manufacturers' Activities

Louis B. Neumiller, who began his association with Caterpillar Tractor Co., of Peoria, Ill. 26 years ago as a stenographer and blue print clerk in the engineering department, has been elected president of the company succeeding **B. C. Heacock**, who became chairman of the Executive Committee. Neumiller spent some time in the assembly shops, became drafting room supervisor and parts manager and in 1931 was advanced to general service manager. He became sales manager for the central division in 1937 and later director of industrial relations and a vice president of the company. In a reallocation of duties at Caterpillar following Mr. Neumiller's election to the presidency **T. J. Connor**, vice president, was assigned general supervision of the industrial and public relations departments in addition to heading the departments of manufacturing, engineering and purchasing which he had previously administered. Mr. **T. R. Farley**, vice president, has been assigned direction of the parts and service departments in addition to direction of the merchandise department.

William W. Coffeen has been appointed research associate for the Porcelain Enamel Institute at the National Bureau of Standards. Mr. Coffeen was formerly an instructor in ceramic engineering in the Georgia School of Technology at Atlanta.

The Foxboro Co., Foxboro, Mass., has announced the following additions to its staff: **Elmer E. Forslind**, a graduate of Northeastern University and for several years in various branches of public utility engineering, has joined The Foxboro Co. and will be attached to the New England office. **William W. Nelson**, who for the past four years has been a Foxboro service engineer, has been transferred to the New England sales force. Mr. Nelson is a graduate of Tufts College, with special engineering training from Boston University. **Paul T. Graff** has joined the staff as a sales engineer, specializing in the promotion of the company's control instrumentation.

Chain Belt Co. of Milwaukee has announced the following changes in personnel: **W. B. Marshall**, who has been assistant sales manager of the conveying and engineering products division, has been made sales manager of that division. Mr. Marshall has been with the company since 1920, and is a graduate from Sheffield Scientific School of Yale University. **B. E. Sivyer**, former San Francisco branch manager, has been transferred to Milwaukee as assistant sales manager of the Chain Belt and transmission division. He will be succeeded at San Francisco by S. Y. WARNER, who has recently been in the company's Los Angeles office and the California oil fields.

HOWARD J. MULLIN has been appointed assistant to manager of sales for CARNEGIE-ILLINOIS STEEL CORP., at Detroit, Mich. Mr. Mullin goes to Detroit from Kansas City, Mo., where he has been assistant manager of sales since 1938.

MILTON W. LIGHTCAP, in charge of maintenance sales for the Devoe & Reynolds Paint Co., New York City, has just been appointed sales manager of the newly created Painter and Maintenance Division. Mr. Lightcap was formerly head of the Pittsburgh Plate Glass Co.'s maintenance division.

CHARLES E. BROWN, formerly of Akron, Ohio, has been appointed advertising manager for the Dennison Engineering Co., Columbus, Ohio, manufacturers of hydraulic equipment.

THE FOXBORO CO. announces the opening of a new Cincinnati office at 607 American Building, Walnut Street and Central Parkway, with YEATMAN ANDERSON in charge.

CUTLER-HAMMER, INC., of Milwaukee, has announced the transfer of C. G. SKIDMORE, Cutler-Hammer expert on motor control for power plants, from New York to Philadelphia. Previous to his association with Cutler-Hammer, Mr. Skidmore was employed by the U. S. Bureau of Reclamation as a design engineer on control for power plant equipment.

THE ASPHALT TREATMENT CORP., 140 Cedar St., New York, have announced appointment of the following contractors who are now acting as suppliers and distributors of Kotal in their respective territories: The General Crushed Stone Co. at Winchester, Mass., Watertown, N. Y., LeRoy, N. Y. and Quakertown, Pa.; C. W. Blakeslee & Sons, New Haven, Conn.; Andresen Corporation, Niles Center, Ill.; Highway Utilities Co., Niles Center, Ill.; Skokie Asphalt Co., Skokie, Ill.; Drummond & Co., Pikesville, Md.; Mack Construction Co., Pawtucket, R. I.; Black Top Roads, Inc., Harrisburg and Hollidaysburg, Pa.; Halton Amiesite Construction Co., Mt. Vernon, N. Y. Kotal is a product of industrial research by the company's waterproofing specialist, HERBERT R. PEARSON, and is an effective anti-stripping and waterproofing agent, permitting asphalt mixes to be spread on wet roadbeds of stone and other aggregate during any season of the year.

Water Supply is the Backbone of National Defense!

Army Camps, greater industrial plants and industrial housing, plus increased fire hazards, demand the highest type of Water Works Equipment to meet the emergency.

SMITH EQUIPMENT

meets every demand

Valves and hydrants must serve well these days — repair parts are hard to get, repairs cost more money. Water Works men who are using SMITH Equipment are congratulating themselves on their freedom from expense and worry. Many big cities have standardized on SMITH — need we say any more?

P.S. You'll be interested in the latest SMITH folders — even if you can't get the equipment today. They belong in your reference files for ultimate economy.

THE A. P. SMITH MFG. CO.

EAST ORANGE, N. J.

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409 Texas St., El Paso, Texas
315 N. Crescent St., Flandreau, S. D.
901 Wm. Oliver Bldg., Atlanta, Ga.
59 Oak Vale Ave., Berkeley, Calif.
524½ First Ave. S., Seattle, Wash.

. . . If you want to make speed profitably . . . GET DEPENDABLE EQUIPMENT . . Buy the Fast . . .

JACKSON Hydraulic Concrete Vibrator

DESIGNED TO "TAKE IT" 3 SHIFTS A DAY—EVERY DAY

- Automatic pressure lubrication—requires no attention.
- 34-ft. hose—2¾" vibrator head.
- Adjustable frequency to 6800 R.P.M.—submerged in concrete.
- Powerful gas engine—4.7 H.P.
- Long-lived, ball-bearing, rotary, hydraulic pump.

USED EXCLUSIVELY BY MANY LARGE DEFENSE CONTRACTORS

ELECTRIC TAMPER & EQUIPMENT CO.

LUDINGTON, MICHIGAN

A MOUTHFUL at EVERY BITE • • • • •
in ALL KINDS of MATERIAL with OWEN BUCKETS

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BRANCHES: NEW YORK, PHILADELPHIA, CHICAGO, BERKELEY, CALIF.

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DIAMOND AND SHOT CORE BORINGS—DRY SAMPLE BORINGS

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Foundation Testing for Bridges, Dams and All Heavy Structures

Also

Manufacturers of Diamond and Shot Core Drills, Accessories and Equipment

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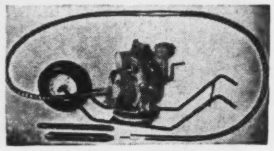
LOW COST



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PORTABLE VIBRATORS
GRINDERS
IMMEDIATE SHIPMENT

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1526 Wood St. Philadelphia, Penna.

BAILY CONCRETE VIBRATORS

DE LAVAL STEAM TURBINE CO. TRENTON, N.J.

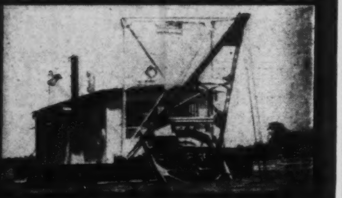
Manufacturers of

STEAM TURBINES . . . HELICAL and WORM GEARS . . . PUMPS: Centrifugal, Propeller, Clogless, Mixed Flow, Rotary Oil . . . Pump Priming Systems . . . CENTRIFUGAL BLOWERS and COMPRESSORS.

DREDGES

HYDRAULIC ★ DIPPER
DERRICK BOATS

HULLS - BARGES - SCOWS



AMERICAN STEEL DREDGE CO., INC.
Fort Wayne, Ind.
Write for Bulletin RD-102

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Engineers Contractors

STRUCTURAL STEEL

RAILWAY AND HIGHWAY BRIDGES

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FOR SEWAGE TREATMENT AND WATER SUPPLY . . .

● Venturi Tubes, Weirs, Flumes, Nozzles and other primary elements; Mechanically and Electrically operated Registers and Complete Automatic Control Systems.

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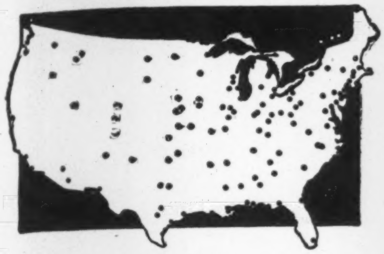
ELSIE EAVES, Manager *SCOTT McLEOD, Statistician*
(Daily service also available—Write for details)

Location of ENR Correspondents



Symbols and Abbreviations Include:

†	Federal Government
★	Project of $500,000 or over
ENR	Engineering News-Record
CD	Engineering News-Record Construction Daily

Projects—By Size

Construction projects here reported cover the United States and Canada, are of these minimum sizes or larger; water supply, earthwork, waterworks, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

Classes of Construction

(Named in order of Listing)

Water Supply
Sewers, Waste Disposal
Bridges, Grade Cross'gs
Streets & Roads
Earthwork, Waterways
Unclassified
Latin America
Public Buildings
Commercial Buildings
Industrial Buildings

Stages Reported

PROPOSED: (except Streets & Roads):

BIDS ASKED (new announcements only. For full calendar, see also preceding issues of ENR);

LOW BIDDERS: All low bidder news will be the final reports published on the projects involved except where award is not made to the low bidder. In this case, a supplementary contract award report will be published.

CONTRACTS AWARDED: Except awards to low bidders previously reported in low bidder stage.

Dates shown are of issue in which last previous report was published.

WATER SUPPLY

PROPOSED WORK

†Calif., El Paso de Robles—City, WW sys., addns. and extens., Docket Calif. 4-220. $42,300. **DPW.**

†Calif., San Luis Obispo—City, WW sys., imprvs. and addns., Docket, Calif. 4-151. $338,100. **DPW**. CD 10/4/39—ENR 10/12/39.

Calif., San Francisco—City and San Francisco Co. Sutro Reservoir. Over $50,000. Bd. Supervs. appropriates $36,000 for site purchase. L. T. McAfee, ch. engr. P. Utilities Comn., 425 Mason St.

†Conn., Groton—Boro, steel water storage reservoir, watermains, hydrants, etc., Docket Conn. 6-103. $104,400. **DPW.** Metcalf & Eddy, Statler Bldg., Boston, Mass., consult. engrs. CD 9/22—ENR 9/25.

†Conn., New London—City, high level reservoir, pump. and chlorine stations, force mains, supply mains, Docket Conn. 6-126. $349,986. **DPW**. K. Holmes, city engr. CD 9/30—ENR 10/2.

†Ga., Macon—City, 3 m.g. clear well, addnl. filters, pipe lines, elevated tanks, incl. equip., etc., Docket Ga. 9-117. $488,120. **DPW**.

Idaho, Shoshone—WW imprvs. $73,227. R. J. Briggs, Robert Noble Bldg., Boise, engr.

†Ill., Bethalto—Village water and sewerage sys., Docket Ill. 11-130. $303,000, **DPW.**

†Ill., Rantoul—Village, WW sys. addns., imprvs., incl. tanks, etc., Docket Ill. 11-105. $44,000. **DPW.**

†Ind., Charlestown — Town, acquisition of and addn., extens., imprvs., WW sys., Docket Ind. 12-139. $171,000. **DPW.**

†La., Pineville—Town, water and sewer facilities, Docket La. 16-129. $308,000. **DPW**.

Mass., Worcester—H. Green, comr. P. Wks., City Hall, WW expansion, pump. facilities, Wachusett Reservoir. $45,000 appropriation granted. E. R. Perry, City Hall, engr.

†Miss., Hattiesburg—City, WW sys. addns., imprvs., Docket Miss. 22-101. $140,000. **DPW.**

†Miss., Pascagoula—City. WW sys. imprvs., extens., Docket Miss. 22-117. **DPW.**

Mo., Neosho—Mayor, 1 mi. 10 in. pipe, 52,000 ft. smaller sizes. $353,535. H. T. Lawrence, 3244 NW. 14 St., Oklahoma City, Okla., engr.

Mont., Fairfield—T. G. Raitt, town clk., water sys. $65,000. J. W. Hall, Fort Shaw, engr. CD 9/17—ENR 9/25.

Neb., Nebraska City—Voted bonds exten. water and gas distr. sys. $300,000. Ethel Gaskill, city clk.

★**†N. H., Portsmouth**—City, filtration plant, dam, supply lines and distr. sys., Docket N.H. 27-104. $857,000. **DPW.** Whitman & Howard, Inc., 89 Broad St., Boston, Mass., engrs. CD 9/23—ENR 9/25.

N. J., Newark—8,200 ft. 3- to 12-in. watermains, Newark Airport, $30,392; water supply lines in disposal area, Route 25, $35,000. WPA.

N. C., Conover—P. W. Herman, mayor, bond election soon, water and sewerage sys.

★**†N. C., Fayetteville**—City, water distr. sys. addn., mains, hydrants, Docket N.C. 31-109, $220,000; 6 m.g.d. capacity water filtration plant, Docket N.C. 31-111, $601,800. **DPW.** CD 9/18—ENR 9/25.

O., Lucas—L. M. Smith, mayor, $18,000 bond election Nov. 4, WW sys. expansion.

O., Somerset—J. W. Drum, mayor, voted bonds WW sys. $40,000. CD 3/4—ENR 3/6.

Pa., Portage—Portage Municipal Auth., R. Quigley, Sr., chn., c/o Boro Council, plans acquiring, imprv. facilities Portage Water Co. Over $15,000.

Tenn., Atwood—Mayor, WW and sewerage sys. $300,000.

Tenn., Huntington—P. W. Maddok, mayor, WW and sewerage sys. $241,000.

Tenn., Kingsport—W. L. Holyoke, dir. P. Wks., City Hall, preliminary surveys WW extens., imprvs., etc., $40,000. Wiedeman & Singleton, Candler Bldg., Atlanta, Ga., engrs. CD 7/16—ENR 7/24.

Tenn., Manchester—T. A. Johnson, mayor, WW and sewerage sys. $368,000.

Tenn., Milan—J. W. Creswell, mayor, WW and sewerage sys. $400,000.

Tenn., Winchester—WW imprvs. and addn., 150,000 steel tank, c.i. pipe line from spring to filter plant. 2 filters, etc. $69,000. Applied for DPW gr. and loan. W. L. Picton, 711 Amer. Bank Bldg., Nashville, engr. CD 8/28—ENR 9/4.

Tex., Brazoria—Brazoria Co. Water Control & Imprvt. Dist. 1, c/o G. E. Cole, WW deep well, tank, distr. sys., etc., Tex. 41-353. $77,706. Applied for DPW funds.

Tex., Grand Prairie—G. H. Turner, mayor, water and sewer imprvs., disposal plant, etc., (Tex. 41-373). $152,720. Applied for DPW funds. Burleson & Garrett, Box 307 A, engrs.

†Tex., Mineral Wells—City, J. C. Miller, mayor, WW sys. imprvs. $237,000. **DPW.** J. Montgomery, Littlefield Bldg., Austin; and J. J. Rady, Majestic Bldg., Fort Worth, engrs.

Tex., Sherman—R. L. Hall, mayor, WW sys. main extens., imprvs. $45,000. Applied for DPW funds. J. C. Bryant, city clk.

†Va., Port Royal—City, WW sys. addns., imprvs., Docket Va. 44-208. $14,600. **DPW.**

†Va., Radford—City, WW imprvs., 2 m.g. filtration plant, Docket Va. 44-146. $193,000. **DPW.**

Ont., Aurora—WW imprvs., reservoir. $25,000. A. Langman, Town Hall, engr.

BIDS ASKED

Bids Asked October 14

Mass., Dighton — Bristol County Agricultural School Trustees' Office, Segregansett St., 10x14 ft., brick, concrete pump. sta., 40 ft. well, pump. equip., Agricultural School. Hayden, Hardin & Buchanan, Park Sq. Bldg., Boston, engrs.

Bids Asked October 24

†D. C., Wash.—U. S. Eng., 1 and Douglas Sts. N.W., furnishing, del. 970 tons reinforcing steel, etc., site South Filtered-Water Reservoir; constructing South Filtered-Water Reservoir. McMillan Reservation, D. C.; adv. ENR 10/9.

Bids Asked October 27

Conn., Hartford — Bd. Contr. & Supply, Metropolitan Dist., R. Dillon, clk., Municipal Bldg., 550 Main St., Contr. 67, Nepaug Pipe Line 2, Avon and Farmington; adv. ENR 10/9.

Bids Asked

Calif., Vallejo—20 in. c.i. water supply pipeline.

LOW BIDDERS

Calif., San Francisco—Pub. Utilities Comn., City Hall, Sept. 23, removing, reconditioning 44 in. steel Corral Hollow pipeline, from M. J. Lynch, Barneveld and Oakdale Sts. **$52,132.** CD 9/11.

Mont., Havre—G. W. Patterson, city clk., Sept. 22, diversion dams, canals, concrete drops on Bull Hook project for WW sys., from J. L. McLaughlin, Box 1824, Great Falls. **$208,833.** CD 9/16 under Earthwork, etc.

Okla., Oklahoma City—E. Simon, city clk., Sept. 30, alterations, addns., exten. water purification plant, from Ottinger Bros. Co., Hinton. **$234,058.** Est. $194,300. CD 9/23.

Pa., Phila.—Dpt. P. Wks., City Hall Annex, watermains, Contr. 117 WW1, from J. Salvucci, 66 St. and Callowhill, **$39,433.**

Wash., Tacoma—City, Oct. 1, furnishing, installing 9,910 ft. 58 in. concrete pipe for Green River gravity line between S. 64 and 94 Sts., from American Concrete & Steel Pipe Co., 459 E. 15 St., **$197,461;** furnishing, del. at side of ditch same amount of steel pipe, from Steel Tank & Pipe Co., 518 N.E. Columbia Blvd., Portland, Ore., **$156,612.** CD 9/18—ENR 9/25.

CONTRACTS AWARDED

†Calif., Stockton—Con. Q.M., Fort Mason, water, gas and sanitary sewerage sys., 4th Echelon Base Motor Repair Shop, Inv. W 6616-42-16, to R. Gould, 309 East Weber Ave., **$66,397.** CD 9/16.

Ill., Weldon—R. Smallwood, village clk., WW exten., imprvs., etc., to Benjamin Lewis & Co., 4841 S. Champlain St., Chicago, Ill. Est. **$50,000.** Bids 8/21. CD 8/27—ENR 9/4.

Ia., Danville—Water and sewerage sys., **WPA. $120,300.** CD 9/4—ENR 9/11 under Sewers.

O., Sandusky—E. B. Badger & Son Constr. Co., Feick Bldg., 3,000 ft. 42 in. rein.-con. pipe intake pipeline from Lake Erie to Plum Brook ordnance plant, to L. A. Wells Constr. Co., Schofield Bldg., Cleveland. Est. **$200,000.**

Pa., Morrisdale—Boro Council, c/o C. J. Kronz, chn. Com., in charge, pump. sta., tank storage facilities, distr. lines. **WPA. $32,000.**

Pa., Sellersville—U. S. Gauze Co., Sellersville, 10,000 gal. steel storage tank, c.i. water pipe lines from well to factory, Clymer Ave., separate contracts. **$18,000.**

Wash., Buckley—State Dpt. Finance, Budget & Business, Olympia, 2,200 ft. 8- to 10-in. and 7,200 ft. 8 and 10 in. steel water supply line; chlorinating plant, etc. Western State Custodial School, **WPA. $104,821.** CD 9/19—ENR 9/25.

B. C., Coal Harbour—Dpt. National Defense for Air, Ottawa, Ont., water supply and distr. at R.C.A.F. Station, to Northern Constr. Co. Ltd., and J. W. Stewart, Ltd., 736 Granville St., Vancouver. **$60,000.**

Ont., Peterboro—E. A. Outram, municipality clk., watermain, day labor under supervision R. H. Dobbin, City Hall. **$50,000 voted.** R. H. Parsons, City Hall, engr. CD 9/12.

Que., Cap de la Madeleine—F. Beaumier, municipality clk., artesian well, concrete reservoir, and 9,000 ft. 10 in. watermain, day labor. **$70,000.** E. Fleury, 7 Niverville St., Three Rivers, engr. CD 10/1.

Que., St. Jean — Dominion Govt., Ottawa, Ont., water distr. plant, to Marien Wilson Ltd., 1434 Ste. Catherine St. W., Montreal. **$32,000.** Dpt. Air Defense, Ottawa, Ont., archts. Dpt. Munitions & Supply, Ottawa, Ont., engr.

Sask., Caron—Dpt. National Defense for Air, Ottawa, Ont., water and sewerage sys., E.F.T. School, to R. B. MacLeod & Co., Ltd., 60 York Bldg., Saskatoon. **$36,000.**

SEWERS, WASTE DISPOSAL

PROPOSED WORK

†Ala., Jacksonville—City, sewage treatment plant, Docket Ala. 1-127. $26,500. **DPW.**

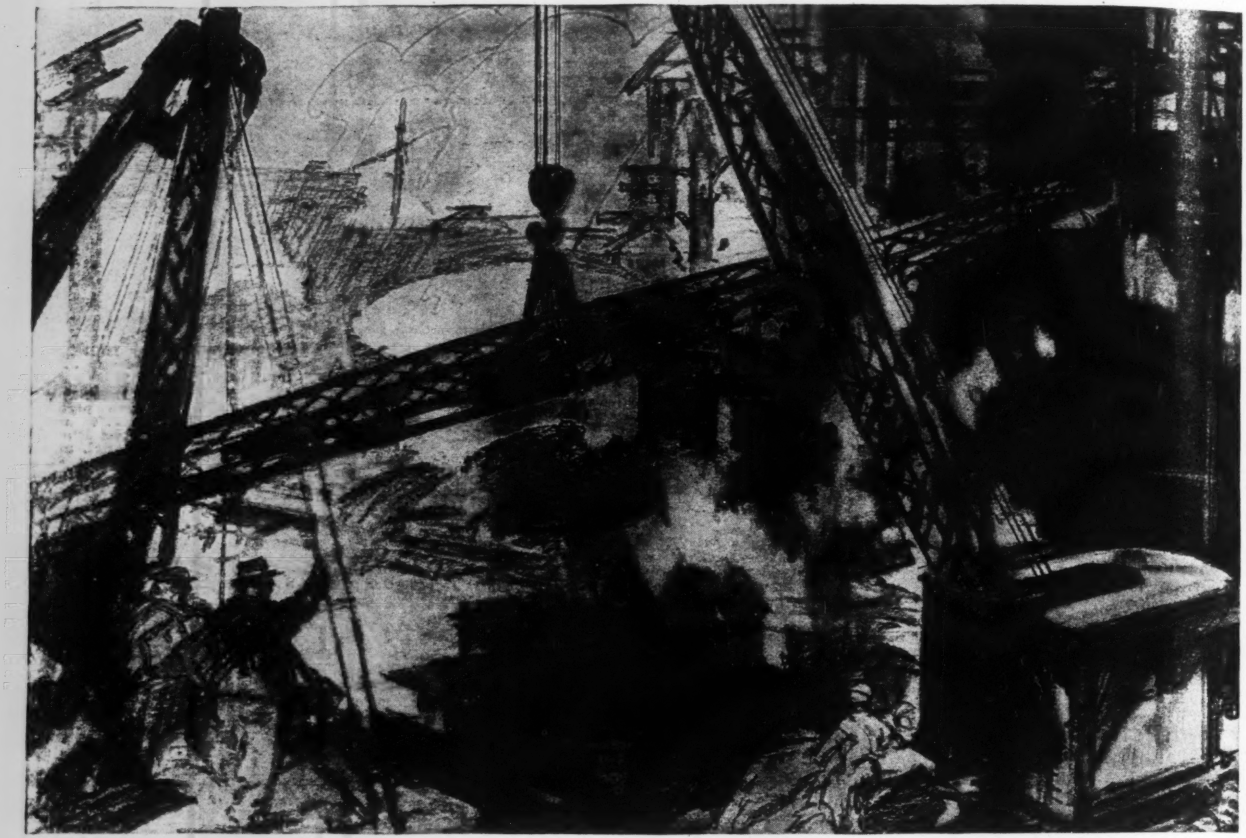
Ark., Jacksonville—Sewerage sys. $152,590.

Ark., Texarkana—W. M. Elrod, mayor, sewage disposal plant. $216,000. M. Z. Bair, Gazette Bldg., Little Rock, engr. CD 9/26—ENR 10/2.

Calif., Oakland—Made plans 655 lin. ft. 8 in. vitr. sewer and 30 lin. ft. vitr. sewer with concrete jacket manholes, etc. W. Frickstad, city engr.

†Calif., San Luis Obispo—San Luis Obispo Co. (pending the formation of San Miguel Sanitary Dist.), sewerage sys. and disposal plant, Docket Calif. 4-147. $143,000. **DPW.**

From measurements to new boom in 48 hours



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SEWERS, etc. (Proposed Work, Cont'd.)

†Calif., Vallejo—City, sewerage sys. extens., imprvs., Docket Calif. 4-191. $270,500. **DPW.** CD 4/30—ENR 5/8.

†Colo., Pueblo—Comrs. Pueblo Co., on behalf East Mesa Sanitary Dist. (district to be formed), sanitary sewerage sys., near here, Docket Colo. 5-103. $48,700. **DPW.**

†Colo., Pueblo—Comrs. Pueblo Co., on behalf Minnequa Heights Sanitation Dist. (district to be formed), sanitary sewerage sys. for housing area, Minnequa Heights, near Pueblo, Docket Colo. 5-104. $96,300. **DPW.**

★**Conn., Bristol**—D. J. Donovan, supt. P. Wks., sewerage sys., Forestville sect. $600,000. Metcalf & Eddy, 1300 Statler Bldg., Boston, Mass., engrs.

Conn., Hamden—Bd. Selectmen, Town Hall, preliminary plans pump. station, 8 in. vitr. tile sewers, State and David Streets, Ridge and Quaker Rds. $25,000.

Ill., Chicago—Sanitary Dist. of Chicago, 910 S. Michigan Ave., received no bids Aug. 21, 2,700 tons unfabricated steel Div. Q, West-Southwest Sewage Treatment works, in Stickney. CD 8/4—ENR 8/14.

†Ind., La Porte—City, sewage treatment plant addns., imprvs., Docket Ind. 12-119. $62,600. **DPW.**

†Mo., Rolla—City, exten. sanitary sewerage sys., constructing outfall sewer, complete sewage treatment plant, Docket Mo. 23-106. $298,180. **DPW.** CD 9/8—ENR 9/11.

N. J., Egg Harbor and **Galloway**—City of Atlantic City, City Hall, Atlantic City, storm drainage facilities for airport. $150,000. WPA. G. R. Swinton, 930 Atlantic Ave., Atlantic City, owner's and WPA engr.

N. J., Jersey City—Hudson Co., Court House, 659 concrete block catch basins, various roads. $50,425. WPA. F. Radigan, Court House, WPA and co. engr.

N. J., Nutley—Trunk line sewer, Kingsland Ave. $50,000. D. Shepherd, Town Hall, engr.

†N. J., Wrightstown—Boro, sewage disposal sys., Docket N. J. 28-117. $72,500. **DPW.**

N. Y., Massena—Incinerator and sewer. Over $25,000. W. Clark, c/o owner, engr.

★**N. C., Fayetteville**—City, sewage treatment plant, Docket N.C. 31-110. $854,000. **DPW.** CD 9/18—ENR 9/25.

N. C., Jacksonville—C. E. Warn, mayor, disposal plant, sewerage sys. Docket 31-122. $225,000. W. F. Freeman, High Point, engr.

O., Bluffton—W. A. Howe, mayor, bond election in spring, sewerage sys., treatment plant. $90,000. W. A. Howe, mayor. Champe, Finkbeiner & Assoc., Nicholas Bldg., Toledo, enrgs.

†O., Port Clinton—Village, sanitary sewerage facilities, Docket Ohio 33-102. $298,860. **DPW.** CD 6/13—ENR 6/19.

†S. C., North Charleston—North Charleston Pub. Serv. Dist., outfall sewer, pump. facilities, equip., Docket S.C. 38-118. $46,000. **DPW.**

Tex., Dickinson—Galveston Co. Water Control & Imprvt. Dist. 1, c/o D. V. DePasquale, sanitary sewage disposal plant, Tex. 41-346. $68,733. Applied for DPW funds. H. G. Olmstead, Box 1016, Houston, engr.

†Tex., Freeport—Town, sewerage sys. addns., extens., Docket Tex. 41-262. $104,877. **DPW.** CD 9/3—ENR 9/11.

Tex., Kerens—City, c/o E. McClung, voted bonds sanitary sewerage sys. imprvs. $38,000. J. J. Rady, Majestic Bldg., Fort Worth, engr. CD 9/10—ENR 9/18.

Tex., Robstown—City, J. W. Kellam, mayor, incinerator and sanitary sewer imprvs., etc., sludge drying beds. $51,906. Applied for DPW funds. Garrett Eng. Co., 3504 Audubon St., Houston, engrs. CD 9/15—ENR 9/18.

Tex., San Antonio—C. K. Quinn, mayor, 400 ton incinerator plant. $488,850. Applied for DPW funds. H. R. F. Helland, Frost Bldg., J. W. Beretta Engineers, Inc., c/o Natl. Bank Commerce Bldg., Matthews & Kenan, Smith-Young Tower, F. T. Drought, Frost Bldg., and W. E. Simpson Co., Milam Bldg., engrs.

Tex., San Antonio—C. K. Quinn, mayor, construction, expansion sewage disposal plant unit. $450,000. Applied for DPW funds.

Tex., Sherman—R. L. Hall, mayor, sewerage sys. exten., sanitary sewers, laterals, etc. (Tex. 41-359). $106,000 Applied for DPW funds. Koch & Fowler, 701 Great Natl. Bldg., Dallas, engrs.

Tex., Wichita Falls—City, c/o C. J. Brannon, Waggoner Bldg., sanitary sewer line exten. $26,355. Applied for DPW funds. J. E. Ward, Harvey-Snider Bldg., engr.

Utah, Ogden—Mabel C. Paterson, city clk., storm sewers. $147,593. Applied to PWA.

†Wash., Bremerton—City, garbage incinerator, Docket Wash. 45-126. $92.400. **DPW.**

Ont., London—Settling tank, west end sewage disposal plant. $35,000. R. W. Garrett, c/o owner, engr.

Que., Courville—L. P. LaPlante, city clk., bids soon, 5 mi. sewers. $100,000. C. Lessard, 32 Blvd. des Allies, Quebec City, engr.

BIDS ASKED

Bids Asked October 14

D. C., Wash.—Dist. Comrs., District Bldg., 955 lin. ft. 10 in terra cotta sanitary sewer, vicinity Kenilworth Ave. and Nash St. N.E.

Bids Asked About October 15

Minn., Albany—E. S. Winter, city clk., sewage treatment plant. $30,000. E. G. Briggs, 1955 University Ave., St. Paul, engr. CD 9/25/40—ENR 10/3/40.

Bids Asked About October 20

Pa., Allentown—30,000 lin. ft. 8 and 10 in. sewers, central and eastern dists. 16th Ward. $90,000. E. Meckley, city engr. CD 8/12—ENR 8/14.

Bids Asked About October 25

Minn., Sargent—T. Knutson, town clk., sewage disposal plant. Over $25,000. E. G. Briggs, 1955 University Ave., St. Paul, engr.

LOW BIDDERS

Md., Baltimore—Bd. Awards, City Hall, Oct. 1, sanitary storm sewers, from J. Matricciani, 229 S. Exeter St. **$123,766.** CD 9/26.

Md., Towson—Comrs. Baltimore Co., Court House, sewers, pump, sta., Sudbrook Park, from Marocco Constr. Co., 231 S. Exeter St., Baltimore. **$119,011.** Est. $100,000. CD 9/17—ENR 9/25.

N. Y., Medina—Sewage disposal plant, from W. Gallagher, 210 E. Center St., **$143,209.** Wm. S. Lozier, 10 Gibbs St., Rochester, engrs.

†Pa., Kingston and **Edwardsville**—U. S. Eng., 332 Post Office Bldg., Baltimore, Md., Sept. 30, 3,000 ft. rein.-con. intercepting sewer, Toby Creek in Kingston and Edwardsville, Luzerne Co., from Thomas Proctor Co., 218 N. 5 Ave., Long Branch, N. J., **$209,986.** CD 9/2—ENR 9/4, under Pennsylvania.

†Pa., Middletown—U. S. Eng., 332 Post Office Bldg., Baltimore, Md., Sept. 23, sanitary sewerage addns., Middletown Air Depot, Proposal 174-42-33, from Thomas M. Flanaghan, American Casualty Bldg., Reading. **$122,945.** CD 9/16—ENR 9/18.

CONTRACTS AWARDED

Calif., Lakewood Village—Directors Lakewood Village Pub. Utilities Dist., 60,000 lin. ft. sanitary sewers. **WPA. $150,000.** Currie Eng. Co., Andreson Bldg., San Bernardino, engr. CD 9/24—ENR 10/2.

Ia., Smithland—F. W. Jones, town clk., sewage disposal plant. **WPA. $55,000.**

Neb., Papillon—O. F. Denker, village clk., sanitary sewers, Dists. 6, 7, 8 and 9, **WPA.** approx. **$55,000.** H. H. Henningson, 626 Standard Oil Co., Bldg., Omaha, engr.

O., Brecksville—B. W. Harris, mayor, sewage disposal plant. **WPA. $100,000.** S. F. David, Cleveland, co. sanitary engr.

Okla., Tulsa—C. H. Veale, mayor, 26,786 lin. ft. 8 in. sanitary sewer lines, appurtenances, sewage pump. Sta., **WPA. $71,000.** W. R. Wooten, City Hall, engr.

Pa., Duquesne—1 story, 40x50 ft., brick, hollow tile incinerator plant, to Pittsburgh-Des Moines Steel Co., Neville Island, Pittsburgh. Bids 8/26. CD 8/22.

Pa., Scranton—Dpt. P. Wks., W. Schunk, dir., sanitary and storm sewers, own forces. Over **$30,000.** F. K. Derby, city engr. CD 9/4—ENR 9/11.

Tex., Houston—Harris Co. Imprvt. Dist., Houston, 17,000 line ft. sanitary sewers, other imprvs., Garden Oaks, near here, **WPA. $52,000.**

Wyo., Rock Springs—Storm sewers, curbs, gutters and paving, to Woodward Constr. Co., Rock Springs. **$32,087.** Bids 9/15. D. P. Miller, city engr.

Alta., Edmonton—Municipality, sewer, Rupert St., day labor under supervision A. W. Haddow, city engr. **$50,000.** CD 9/29.

BRIDGES, GRADE CROSSINGS

PROPOSED WORK

Ill., Chicago—State Dpt. P. Wks. & Bldgs., Div. Hys., Springfield, subway under tracks of Ind. Harbor Belt R. R. Co. and Chicago & North Western Ind. R. R. Co., at existing crossing S. Cicero Ave. (S.B.I. Rt. 50), etc. M. J. Fleming, Centennial Bldg., Springfield, acting chief state hy. engr.

Mass., Worcester—E. R. Perry, ch. Bureau Eng, City Hall, rein.-con. rigid frame bridge over Boston & Albany R. R. tracks, Lake View Dist. $155,000.

†Mich., Detroit—Comrs. Wayne Co., grade separation, incl. under pass to connect new highway south of Michigan Central R.R. tracks, and concrete access roads, Docket Mich. 20-113, $190,000, **DPW.**

N. J., Long Branch—Freeholders Monmouth Co., Freehold, 150 ft. steel, concrete bridge over Shrewsbury River, between Branchport and Long Branch. $60,000. O. R. Seaman, Freehold, engr.

Okla., Guymon—State Hy. Dpt., Oklahoma City, bridge over North Canadian River, U.S. 64. $27,000. V. T. Moon, Oklahoma City, engr.

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TAPES · RULES · PRECISION TOOLS

BRIDGES, etc. (Proposed Work, Cont'd.)

Que., Cap des Rosiers—Province of Quebec, Quebec City, rein.-con. bridge. $25,000. O. Desjardins, Dpt. P. Wks., Quebec City, engr.

Que., Dorval—Provincial Govt., Quebec City, subway under Canadian Pacific Ry. and under Canadian Natl. R. R. adjoining stations. $400,000. Dpt. P. Wks., Quebec City, engr.

Que., Grande Riviere—Province of Quebec, Quebec City, rein.-con. bridge. $25,000. O. Desjardins, Dpt. P. Wks., Quebec City, engr.

Que., Montreal—Canadian National Rys., 360 McGill St., H. A. Dixon, ch. engr. (oper.), subway exten., Shearer St. $40,000.

Que., Montreal—J. E. Gauthier, city clk., subway under Canadian Pacific Ry. tracks, Moreau St. $30,000. J. Brourseau, City Hall, engr.

Que., St. Isidore—Canadian National Rys., 360 McGill St., Montreal, H. A. Dixon, ch. engr. (Oper.), eliminating level crossing at Levis-Jackmaw Hy. level crossing by subway. $100,000.

BIDS ASKED

Bids Asked October 17

Alabama—C. J. Sherlock, dir. State Hy. Dpt., Montgomery, steel superstructure 0.251 mi., Fosters Ferry Bridge, near Tuscaloosa. FAP SN-FAP-150-C(2), Proposal D.

Bids Asked October 30

†O., Massillon—U. S. Eng., Huntington, W. Va., steel bridge superstructure for Pennsylvania R.R. bridge over Tuscarawas River; adv. ENR 10/9. CD 10/3.

LOW BIDDERS

California—C. H. Purcell, engr. State Hy. Dpt., Sacramento, Sept. 24, redecking 2 bridges over Sacramento River and 1 St., at Meridian, Colusa and Sutter Counties, from C. C. Gildersleeve, 2758 Ashby Ave., Berkeley. **$28,607.** CD 9/11.

Maryland—State Roads Comn., Baltimore, Sept. 30, steel bridge on concrete substructure, Contr. B 440-5-460, Baltimore Co., from Williams Constr. Co., Middle River. **$117,020.** CD 9/26.

Wisconsin—State Hy. Comn., Madison, Sept. 30, Turtle Creek Bridge, approaches. 0,142 mi. hy. Beloit, Rock Co., from Luety Bros., Beloit, **$46,716;** Bridge 740, 170 ft., 3 span, and Bridge 741, 115 ft., 2 span, rein.-con. deck girder, Portage and Marathon Counties, from Stein & Holst, Pittsville, **$57,729.** CD 9/11—ENR 9/18 under "Roads."

STREETS AND ROADS

BIDS ASKED

Bids Asked October 14

Connecticut—State Hy. Comn., W. J. Cox, comr., Hartford, rein.-con. paving 11,467 ft. FAP SN 32 A(6) and FAP SN 32 C(2), Berlin and Newington; 5,294 ft. concrete sidewalks, 436 ft. concrete ramps, Windsor, 2,711 ft. bituminous concrete roads, Ansonia, rolled bank run gravel surfacing 9,900 ft. town roads, Stonington. Over $25,000.

Ill., Oaklawn—Waterbound macadam base, bituminous surface treating, storm sewers, culverts, 0.9835 mi. Sect. 2-CS. G. H. Baker, Centennial Bldg., Springfield, state engr. co. roads and city streets.

Maryland—State Roads Comn., Baltimore, macadam shoulders for widening 7.39 mi. hy. between McCool and Celanese plant, Contr. A329-611, Alleghany Co.

Ohio—State Hy. Dpt., Columbus, grading, drainage structures, traffic bound surface course 0.08 mi. Sect. E, SH 739, Ashtabula Co., $9,800; bituminous pre-mixed surface course 6.157 mi. Sects. D, C and E of SH 175, U.S. 68, Clinton Co., $49,800; grading, drainage structures, concrete paving 0.433 mi. sect. East Palestine Hy., SH 89, Columbiana Co., $35,400; grading, drainage structures, concrete paving 1.76 mi. Sect. Sheffields SH 827, Lorain Co., $84,200; asphaltic concrete resurfacing 1.035 mi. Sect. Green Springs of SH 515, Sandusky and Seneca Counties, $14,000; continuous steel beam bridge, concrete deck and substructure over Miami River, rein.-con. and salvaged brick paving 0.142 mi. Section Sidney of SH 192, Shelby Co., $81,400.

★ **Virginia**—Dpt. Hys., Richmond, rein.-con. paving 3 mi. Route 1; waterbound macadam surfacing 2 mi. Route 58, both Mecklenburg Co.; 3.2 mi. Route 11, Rockbridge Co;. 10 mi. Route 60, Powhatan Co.; 0.4 mi. Route 50, Fauquier Co.; 4.6 mi. Route 58, Mecklenburg Co.; 0.4 mi. concrete curb and gutter Route 88 and 195, Southampton Co.; 0.75 mi. bridge, approaches, Route 58, Lee Co.; 1.3 mi. (4 bridges, approaches) Route 360, Hanover and Henrico Counties; 97 ft. bridge, approaches Route 58, Brunswick Co.; 2 bridges Route 12; 1 mi. bridge and road, Route 608, both Augusta Co. Approx. **$1,000,000.** CD 9/29—ENR 10/2.

Bids Asked October 15

Md., Baltimore—Bd. Awards, City Hall, concrete paving streets, Bur. Hys. Contr. CC753.

N. Y., St. George—President Richmond Boro, Boro Hall, bituminous concrete repaving, Decker Ave.

Bids Asked October 16

†Arizona—Pub. Roads Admin., Federal Office Bldg., San Francisco, Calif., grading, drainage structures, base course, bituminous treating Sect. A, Tr. 1, Oregon Pipe Cactus National Monument, Pima Co.

Massachusetts—Commonwealth of Massachusetts, Metropolitan Dist. Comn., Parks Div., 20 Somerset St., Boston, concrete surfacing traffic circle, Grove St. and West Roxbury Parkway, Brookline, $50,000, extended date CD 9/22; resurfacing Mystic Valley Parkway from Mystic Ave. to Mystic River Bridge, Medford, $25,000.

Nevada—Directors Dpt. Hys., Carson City, grading, bituminous surfacing, gravel base, etc., concrete curbing, guttering, etc. 5.99 mi. portion State Hy. Sys. from 13 St., Elko, to point 6 mi. east, Route 1, Sect. B, Elko Co. R. A. Allen, state hy. engr.

Bids Asked October 17

★ **Pennsylvania** — State Hy. Dpt., I. L. Hughes, secy., Harrisburg, rein.-con. paving, constructing 2 rein.-con. structures, 1 plate girder, 2 rein.-con. and 2 over-pass bridges, etc., 38,696 ft. Legislative Routes 148, Sect. 4-A, 137, Traffic Routes 222 and 322, Ephrata and E. Cocalico Twps., Lancaster Co., over $500,000; bituminous on concrete surfacing, drainage 5,723 ft. Legislative Route 169, Sect. 12-A, Traffic Route 115, Wilkes-Barre and Plains Twps., Wilkes-Barre, Luzerne Co.; rein.-con. paving, rein.-con. bridge, 4,500 ft. Legislative Route 18, Sect. 5, Traffic Route 220, Montoursville Boro, Lycoming Co.; bituminous on native stone, type A or crushed aggregate surfacing, 4 rein.-con. structures, deck plate girder bridge, 21,911 ft. Legislative Route 239, Sect. 2, Traffic Route 642, Jordan and Franklin Twps., Lycoming Co.; rein.-con. paving, rein.-con. arch, bituminous surfacing, rein.-con. bridge, etc. 12,237 ft. Legislative Route 151, Sect. 1, Traffic Route 611, Cheltenham and Abington Twps., Montgomery Co.; rein.-con. paving, 2 cement rubble masonry arches, 1 rein.-con. bridge, exten. concrete arch, 18,348 ft. Legislative Route 2, Sect. 2-D, Traffic Route 11, Point Twp., Northumberland Co.; rein.-con. paving, bituminous on reconstructed base surfacing, drainage, 1,396 ft. Legislative Route 02204, Spur E, Sect. 1, N. Fayette Twp., Oakdale Boro, Allegheny Co. T. C. Frame, co. owner, ch. engr.

Vermont—State Hy. Dpt., H. E. Sargent, ch. engr., Montpelier, crushed stone mixed in place with cutback asphalt and refined tar prime coat surfacing 4.765 mi. FAS 172 B(1), Route 30A, Shoreham and Orwell, $75,000.

Bids Asked October 18

†La., New Orleans—Con. Q.M., New Orleans and vicinity, P. O. Box 3248, Station D, 4566 St., Claude St., surfacing roads, LaGarde Hospital, Robert E. Lee and West End Blvds.

Bids Asked October 20

Pa., Titusville—Concrete, asphalt, amiesite or colprovia paving Park Ave. $57,000. Tentative date. J. M. Fay, city engr.

Bids Asked October 22

California—C. H. Purcell, engr. State Hy. Dpt., Sacramento, plantmix on crusher run surfacing 14 mi. and concrete paving 0.3 mi. hy. between Bass Hill and Crespos, Shasta Co.

Bids Asked October 29

Louisiana—Dpt. Hys., W. Prescott Foster, dir., Baton Rouge, bituminous surface treating 12.608 mi. S.R. 35, Amite-Washington Parish line Hy., S.P. 913-02-36, Tangipahoa and Washington Parishes; 7.207 mi. Route 35, Tchefuncta River-Franklinton Hy., S.P. 913-02-45, Washington Parish; 3.6 mi. S.R. 35, Fluker-St. Helena Parish line Hy., S.P. 913-04-85, Tangipahoa Parish; 9.8 mi. S.R. 35, Clinton-St. Helena Parish line Hy., S.P. 913-01-72, Tangipahoa Parish; 9.8 mi. S.R. 35, S.P. 913-01-72, East Feliciana Parish; 9.2 mi. S.R. 35, Tangipahoa Parish line West Hy., S.P. 913-02-27, St. Helena Parish; 8.665 mi. S.R. 35, Amite River-Greensburg Hy., S.P. 913-01-73, St. Helena Parish; lighting sys. for Atchafalaya River Bridge, Route 2, Morgan City, S.P. 5-01-04, St. Mary Parish.

Bids Asked

Illinois—State Dpt. P. Wks. & Bldgs., Div. Hys., Springfield, rejected bids Sept. 24, imprv. 2.52 mi. Rt. 125, detour, Sect. 51G, Sangamon Co. Will readvertise. CD 9/16—ENR 9/18, under LB.

Illinois—State Dpt. P. Wks. & Bldgs., Div. Hys., Springfield, rejected bids Sept. 12, imprv. 0.59 mi. Rt. 12, Sects. 9 R and 10 R, Richland and Clay Counties. CD 9/16—ENR 9/18 under LB.

†Washington—Pub. Roads Admin., Post Office Bldg., Portland, Ore., rejected bids Sept. 10, clearing, grading South Fork Stillaguamish Hy., Mount Baker National Forest, Snohomish Co. CD 9/16—ENR 9/18.

LOW BIDDERS

†Calif., Fort Ord — Con. Q.M., Sept. 25, 26,197 sq. yd. paving, Inv. Q.M. 6665-42-9, from F. J. Twaits & Morrison-Knudsen, P. O. Box 337, Paso Robles. **$45,000.** CD 9/19.

Calif., Pomona—City, Sept. 30, concrete paving 0.75 mi. Holt Ave., from J. E. Haddock, Ltd., 3578 E. Foothill Blvd., Pasadena. **$59,568.** CD 9/22.

†Calif., Stockton—Con. Q.M., Fort Mason, Sept. 26, roads and sidewalks, 4th Echelon Base Motor Repair Shop, Inv. W 7215-42-1, from Doudell Constr. Co., P. O. Box 488, San Jose. **$27,536.** CD 9/17.

STREETS, etc. (Low Bidders, Cont'd.)

D. C., Wash.—Dist. Comrs., District Bldg., Sept. 25, 5,000 sq. yd. concrete sidewalks, 20,000 sq. yd. concrete alley paving, from Highway Eng. & Constr. Co., Inc., 7 and T Sts. N.E., **$60,412.** CD 9/22.

†**Idaho**—Pub. Roads Admin., Ogden, Utah, Sept. 29, clearing, grubbing, grading, surfacing 1.5 mi. North Pacific Forest Hy., Coeur d' Alene National Forest, Kootenai Co., from Elliott & Co., Dexter Horton Bldg., Seattle, Wash., **$175,588.** CD 9/18.

Louisiana—Dpt. Hys., Baton Route, Oct. 1, bituminous surfacing 1.098 mi. S.P. 913-04-14, Evangeline Parish, from R. H. Horton, Inc., Bossier City. **$27,791.** CD 9/12—ENR 9/18.

Maryland—State Roads Comn., Baltimore, Sept. 23, imprv. 2.468 mi. Somerset Co., from C. J. Langenfelder & Sons, Rosedale. **$168,803.** CD 9/17.

N. Y., New York—Comr. Parks, office Dpt. Parks, Arsenal Bldg., Central Park, 64 St. and 5 Ave., Sept. 29, Contr. HRP 41-2, imprv. Hutchinson River Parkway exten., Bronx Boro, from Harlem Contg. Co., 2028 9 Ave. **$30,219.** CD 9/22—ENR 9/25.

★**Pennsylvania**—State Hy. Dpt., Harrisburg, Oct. 3, imprv. 12,355 ft. hy., 2 rein.-con. bridges, Indiana and Cambria Counties, from Laub & Collins, P. O. Box 8606, Wilkinsburg. **$529,205.** CD 9/23—ENR 9/25.

★**Pennsylvania**—State Hy. Dpt., Harrisburg, Oct. 3, imprv. 5,014 ft. Lawrence Co., from New Castle Duntile Co., 1409 Moravia St., New Castle, **$46,015*****4,024 ft. Delaware Co., from James J. Skelly Co., Media, **$63,742*****25,021 ft. Butler Co., from H. B. Mellot, McConnellsburg, **$220,737*****2,550 ft. Allegheny Co., from McCrady Constr. Co., 239 4 Ave., Pittsburgh, **$70,455*****13,729 ft. Wayne Co., from S. Ciccone, 6528 Girard Ave., Phila., **$69,583***** 10,370 ft. Washington Co., from Moyer Bros., 2605 Beale Ave., Altoona, **$176,356*****9,452 ft. Potter Co., from Minns Bros., 117 E. DuBois Ave., DuBois, **$66,899.** CD 9/23—ENR 9/25.

★**Wisconsin**—State Hy. Comn., Madison, Sept. 30, imprv. 1.094 mi. Milwaukee Co., from Kramp Constr. Co., Berlin, **$114,812***** 0.751 mi. Brown Co., from Schuster Constr. Co., Denmark, **$99,667*****9.223 mi. Columbia Co., from Frank Mashuda Co., 5556 W. Roosevelt Dr., Milwaukee, **$371,115*****2.035 mi. Portage and Marathon Counties, and 9.007 mi. Crawford Co., from R. Van Vechten, Wauwatosa, **$144,823** and **$303,571** respectively*** 3.448 mi. Jackson Co., from Hoffman Constr. Co., Black River Falls, **$118,291*****3.759 mi. Vernon Co., from A. Guthrie & Co., Inc., 424 Endicott Bldg., St. Paul, Minn., **$88,698***** 11.626 mi. Rusk and Price Counties and 4.067 mi. Burnett Co., from Cumberland Constr. Co., Cumberland, **$83,950** and **$44,301** respectively***0.744 mi. Barron Co., and 11.626 mi. Rusk and Price Counties, from C. Berg, Campbellsport, **$32,672** and **$81,713** respectively*** 5.045 mi. St. Croix Co., from J. S. Karlsylst, Inc., Stoughton, **$45,898*****2.011 mi. Ashland Co., from Brellenthin Truck & Shovel Service, Elkhorn, **$99,867.** CD 9/11—ENR 9/18.

†**Wyoming**—Pub. Roads, Denver, Colo., bituminous surfacing 9.501 mi. Wyoming Forest Project 2-C5, D5, E3, in Teton and Washakie Natl. Forest, Teton Co., from Northwestern Eng. Co., Rapid City, S. D. **$135,836.** Bids 9/18. CD 9/12.

CONTRACTS AWARDED

Calif., San Francisco—Property Owners, c/o contractors, grading, paving, vitr. sewers, portions Dorcas Way, Newhall and Mission Sts., to Eaton & Smith, 715 Ocean Ave. **$26,560.**

Calif., San Jose—Santa Clara Co., grading, paving, Bascom Ave. and Washington St., to A. J. Raisch, 358 Lincoln Ave. **$30,905.**

†**D. C., Wash.**—U. S. Eng., 1 and Douglas Sts., N.W., excavating 410,000 cu. yd., excavating 410,000 cu. yd. dry earth material, etc. Washington National Airport, Gravelly Point, to Tufano Contg. Corp., 168-22 91 St., Jamaica, N. Y. **$498,233.** Bids 9/10. CD 8/26—ENR 8/28.

Florida—State Road Dpt., Tallahassee, T. A. Johnson, chn., imprv. 3.27 mi. Sumter Co. to J. D. Manley, Leesburg, **$36,823.** Bids 9/23. Rejected bids 9/23 imprv. 8.674 mi. Palm Beach Co. CD 9/16.

Fla., Monticello—Jefferson Co., Monticello, constructing roads, widening, paving roads, **WPA. $80,224.**

Ill., Lincoln—Paving 5 and N. Logan Sts., to Joyce Constr. Co., Springfield, **$36,739.** Bids 9/29—CD 9/23.

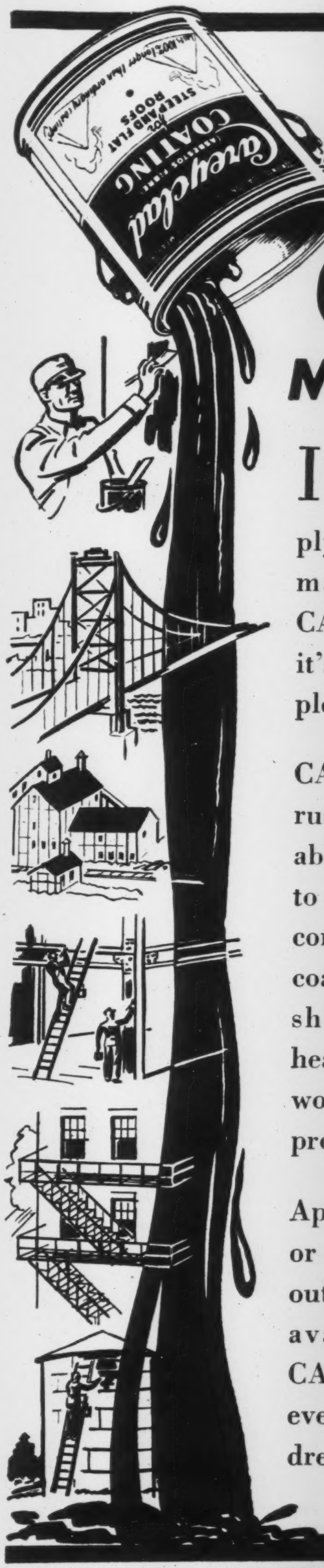
†**La., Camp Claiborne**—Con. Q.M., access and combat roads, to A. C. Campbell, Constr. Co., 86 Crockett St., Shreveport. **$101,859.** Bids 9/20, awarded 9/27.

Maryland—State Roads Comn., Baltimore, imprv. 4.957 mi. Charles Co., to C. J. Langenfelder & Sons, Rosedale. **$383,124.** Bids 9/23. CD 9/17.

Minnesota—State Hy. Dpt., St. Paul, imprv. 39.63 mi. Trunk Hys. 10 and 371, Dist. 4, to Ashworth-Hawkinson Co., St. Louis Park, **$31,186.** Bids 9/19. CD 9/4—ENR 9/11.

Neb., Center—Knox Co., Center, imprv. roads, **WPA. $100,000.**

Nevada—R. A. Allen, engr. State Hy. Dpt., Carson City, imprv. 3.59 mi. Eureka Co., to



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STREETS, etc. (Contracts Awarded)

W. W. Clyde & Co., Springville, Utah. **$239,661.** Bids 9/25. CD 9/17.

N. J., Bayonne—Grading, bituminous surfacing catch basins, manholes, sewers, **WPA. $59,000.** H. A. Jaeger, City Hall, owner's and WPA engr.

N. J., East Orange—Grading, paving, waterlines. **WPA. $62,500.** C. Malstrom, Orange and N. 6 Sts., Newark, owners and WPA engr.

N. J., Egg Harbor and **Galloway Twps.**—City of Atlantic City, City Hall, Atlantic City, grading, 4½ in. asphaltic concrete surfacing 24,200 sq. yd. on runway, Airport, **WPA. $58,500.** G. R. Swinton, 930 Atlantic Ave., Atlantic City, owner's and WPA engr.

†N. J., Fort Dix—Con. Q.M., grading, bituminous concrete paving roads, **WPA. $54,500.**

N. J., Jersey City—Hudson Co., Court House, imprv. roads, 18,518 ft. wire rope guard rails, 7,823 cu. yd. ditch excav., grading slopes, shoulders, etc, **WPA. $60,263.** F. Radigan, Court House, WPA and co. engr.

N. J., Newark—Essex Co. Park Comn., 115 Clifton Ave., grading, excav., 3 in. penetration road resurfacing, 6 in. penetrations paving roads, various parks, **WPA. $95,500.** R. D. Crater, 115 Clifton Ave., WPA and co. engr.

N. J., West New York—Town, Town Hall, grading, resurfacing, resetting curbs, catchbasins. **WPA. $53,818.** C. Malstrom, Orange and N. 6 Sts., Newark, owner's and WPA engr.

†N. Y., Fishers Island and **Port Clinton**—Con. Q.M., Fort H. G. Wright, Fishers Island, roads, drainage, sidewalks, etc., Fort H. G. Wright, Fishers Island, and Camp Perry, Port Clinton, to Joseph A. Bristow, Narragansett, R. I. **$93,990. (Correction**—contractor's name). Bids 9/12, awarded 9/18. CD 9/25—ENR 10/2, under CA.

Ohio—State Hy. Dpt., Columbus, imprv. 4.169 mi. Ashtabula Co., to Koski Constr. Co., Natl. Bank Bldg., Ashtabula, **$32,150,** est. $32,200***4.658 mi. Fulton Co., to P. R. Creager, 324 W. Washington St., Napoleon, **$95,114,** est. $104,550***6.363 mi. Licking and Muskingum Counties, to Lucarelli & Babcox, 1311 Hayden Ave., East Cleveland, **$39,997,** est. $40,800***1.763 mi. Montgomery Co., to Manix Bros., RR 1, Greenville, **$93,394,** est. $100,150***1.43 mi. Sandusky Co., to Modern Constr. Co., Elks Bldg., Fremont, **$91,644,** est. $94,250***3.652 mi. Washington Co., to Muskingum Valley Asphalt & Supply Co., 410 Pearl St., Zanesville, **$58,927,** est. $58,950*** 0.552 mi. Warren Co., to S. Monroe & Sons Sons Co., 2344 Gallia St., Portsmouth, **$48,834,** est. $50, 350***0.063 mi. Williams Co., to H. W. Baker Constr. Co., Wharton, **$49,864,** est. $54,650 Grand total $509,924. Bids 9/30. Received no bids Sept. 30, imprv. 1.041 mi. Preble Co. $20,000. CD 9/17—ENR 9/25.

†Okla., Fort Sill—Con. Q.M., 4.5 mi. concrete paving, Fort Sill Military Reservation to Park Ward Co., 808 E. 17 St., Oklahoma City, **$267,582.** Est. $280,000. Bids 9/25, awarded 9/1. CD 9/22.

Pa., Robesonia—Boro Council, bituminous on stone surfacing, **WPA. $50,562.** W. Spotts, boro enrg.

Pa., Scranton—Dpt. P. Wks., W. A. Schunk, dir., City Hall, sidewalk runway, fire headquarters, Mulberry St., removing trolley rails, repaving Pittson Ave., bituminous surfacing E. Mountain Rd., Theodore, Putnam and Court Sts., Rockwell and Euclid Aves., own forces. **$30,000.** F. K. Derby, city engr.

S. D., Madison—P. M. Rensvold, mayor, paving Washington Ave., imprv. city streets, alleys. **WPA. $50,000.**

Tenn., Carthage—J. H. Ligon, mayor, paving 3 mi. streets. **WPA. $50,000.**

Tenn., Milan—J. W. Creswell, mayor, imprv. streets, **WPA. $146,000.**

Tenn., Sweetwater—Monroe Co., imprv. farm-to-market roads, **WPA. $150,000.**

Tex., Refugio—Refugio Co., c/o T. G. Jeter, judge, imprv. 15.429 mi. roads, Precinct 4, Rd. Dist. 6, to Standifer Bros., Big Wells, **$95,744.** Bids 9/29. CD 9/16—ENR 9/18.

†Utah, Salt Lake City—U. S. Eng., 751 S. Figueroa St., Los Angeles, Calif., street imprvs., Salt Lake Military Airport, to W. E. Ryberg Co., 1259 E and Temple St., and Mullins & Wheeler, 22½ E. 1 St. S., **$42,963.** Bids 9/26. CD 9/16—ENR 9/18.

N. S., Debert—Dominion Govt., Ottawa, Ont., asphalt paving 7 mi. military road, to Rayner Constr. Co., Ltd., Highway St., Debert Station. Est. **$75,000.** Dpt. National Defense, Ottawa, Ont., engrs.

Ontario—Dpt. Hys., Toronto, paving 5 mi. Durham-Allan Park Hy., to Standard Paving, Ltd., Harbour Com. Bldg., Toronto, est. about **$100,000,** Bids 8/26, CD 8/12, ENR 8/14; paving, grading, Malton Airport, to Curran & Briggs, Ltd., Manning Chambers, Toronto, est. **$45,000.**

Ontario—Dpt. Hys., Toronto, concrete paving 6 mi. Wellandport to Beckett's Bridge, to Housberger Constr. Co. Ltd., Vineland, est., **$120,000;** hot mixed paving (gravel), 5 mi. Port Albert Airport, to Sterling Const. Co., Ltd., 2494 Sandwich St., Windsor., **$75,000.**

Ontario—R. M. Smith, deputy minister Hys., Toronto, imprv. 7 mi. Beaverton-Brechin Rd., **to A. E. Jupp Constr. Co. Ltd.,** 56 Boultbee

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STREETS, etc. (Contracts Awarded, Cont'd.)

Ave., est. **$140,000*****8 mi. Corunna-Sombra Rd., to Ryan Contg. Co. Ltd., 210 Detroit St., Windsor, est. **$160,000;** 9 mi. Brantford-Burford Rd., to Towland Constr. Ltd., 294 Dundas St., London, **$45,000.** Grand total $345,000. Bids 8/27. CD 8/12—ENR 8/14.

Ont., Prescott — Constructing roads, to Storms Constr. Co., Ltd., 49 Givens St., Toronto. **$27,000.** Engineer, c/o W. S. Johnstone, Town Hall, engr.

Que., Montreal—J. E. Gauthier, city clk., asphalt paving Bonsecours and Robin Sts., to Charles Duranceau Ltd., 5847 Hamilton St., **$28,097.** J. Brouneau, City Hall, engr.

Que., Pike River—Province of Quebec, Quebec City, grading road, to P. Baillargeaon, 264 Champlain St., St. Jean. **$48,500.** E. Gohier, Dpt. Roads, Quebec City, engr.

EARTHWORK WATERWAYS

PROPOSED WORK

Calif., Santa Monica—Widening beach 100 ft. by using sand to be dredged from yacht harbor area, constructing 400 ft. stone groynes. $325,000. H. B. Carter, City Hall, engr.

Mass., New Bedford—P. Wks. Dpt., Municipal Bldg., bulkhead, Clark's Cove.

†Mo., Washington—U. S. Eng., 601 Davidson Bldg., Kansas City, constructing 7,167 ft. accretion pavement in Missouri River between Southpoint Reach and Hinkles Bend. $160,000.

N. J., Bloomfield—Essex Co. Park Comn., 115 Clifton Ave., Newark, flood control of 2nd River, deepennig, widening, paving bottom and constructing retaining walls, Watsessing Park. $47,500. WPA. R. D. Crater, 115 Clifton Ave., Newark, WPA and co. engr.

†Pa., Columbia—U. S. Eng., P. O. Bldg., Baltimore, Md., extensive imprvs. to Susquehanna River, vicinity of here. Over $20,000.

Pa., Emporium—Dpt. Forests & Waters, C. E. Baer, deputy secy., in charge, Harrisburg, dam, Sizerville State Park, 8 mi. north of here. $18,000.

†Tex., El Paso—International Boundary Comn., c/o L. M. Lawson, comr., 1st Natl. Bank Bldg., El Paso, bids in November, canalization project, 100 mi. on Rio Grande River from near El Paso, Tex., to Caballo Dam in New Mexico. $490,000 appropriation approved. J. L. Lytle, Farmers Bank Bldg., San Benito, engr. CD 2/3—ENR 2/6.

Tex., Robstown—Nueces Co. Drainage Dept. 2, c/o A. M. Stone, Robstown, drainage sys., drainage facilities, widening, deepening existing ditches, etc. $483,595. Applied for DPW funds. Garrett Eng. Co. 3504 Audobon St., Houston, engrs.

BIDS ASKED

Bids Asked October 14

†New Jersey—U. S. Eng., 900 Customhouse, 2 and Chestnut Sts., Phila., Pa., dredging 28,000 cu. yd. place measurement, materials from Cohansey River, N. J.

N. Y., Marine Park—Comr. Parks, Office Dpt. Parks, Arsenal Bldg., Central Park, 64 St. and 5 Ave., New York, steel bulkhead, beginning Fairlawn Ave., concrete bridge, etc., Contr. R-16-241, Richmond Boro. Extended date. CD 9/29—ENR 10/2, under BA.

Bids Asked October 15

†Illinois—U. S. Eng., Clock Tower Bldg., Rock Island, imprv. levees along both sides Ellison Creek in Henderson Co. D. D. 2, Henderson Co., 16,500 ft. levee and movement about 57,000 cu. yd. material.

Bids Asked October 17

†California—Bureau Reclamation, Old Post Office Bldg., Sacramento, clearing part Shasta reservoir site, Kennett Div., Central Valley Project, Spec. 977; adv. ENR 10/9. CD 10/3—ENR 8/7.

Bids Asked October 20

†Missouri—U. S. Eng., Clock Tower Bldg., Rock Island, Ill., imprv. levees Union Twp. D.D., Lewis Co., near La Grange, 5,810 cu. yd. enlargement, 1,160 cu. yd. banquette and 156,900 cu. yd. borrow pit fill; adv. ENR 10/9.

Bids Asked October 21

†Louisiana—U. S. Eng., P. O. Box 60, Vicksburg, Miss., approx. 300,000 cu. yd. earthwork, west bank Mississippi River, Inv. 1106-42-50.

Bids Asked October 29

†California—Bureau Reclamation, Old Post Office Bldg., Sacramento, earthwork, concrete lining, structures, Sta. 6 plus 10 to Sta. 301 plus 60, Friant-Kern Canal, Friant Div., Central Valley Project, Spec. 1000; adv. ENR 10/9.

Bids Asked October 31

†New York—U. S. Eng., Whitehall Bldg., 17 Battery Pl., New York, dredging, disposing 71,315 cu. yd. place measurement, material except ledge rock from English Kills, Newtown Creek; adv. ENR 10/9.

LOW BIDDERS

†Connecticut—U. S. Eng., 819 Industrial Trust Bldg., Providence, R. I., Sept. 30, dredg-

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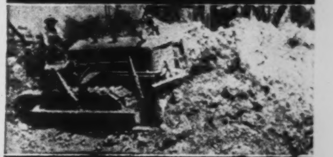
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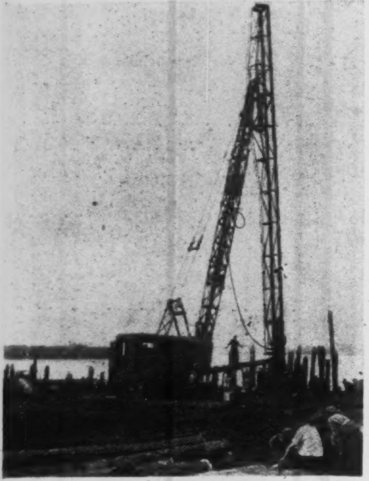

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ing 47,000 cu. yd. Milford Harbor, from Joseph B. K. Heling for Estate of Chas. Heling, 168 N. Wellwood Ave., Lindenhurst, N. Y., **35.9c.** per cu. yd. total **$16,873.** CD 9/16—ENR 9/18.

†Connecticut — U. S. Eng., 819 Industrial Trust Bldg., Providence, R. I., Oct. 2, 133,000 cu. yd. maintenance dredging, Mystic River, from J. S. Packard Dredging Co., 1 Court St., Boston, Mass. **$39,102.** Est. $38,300. CD 9/22—ENR 9/25.

Mont., Havre—G. W. Patterson, city clk., Sept. 22, constructing Bull Hook Diversion dams and canals, from J. L. McLaughlin, Ford Bldg., Great Falls. **$208,833.**

O., Cleveland—F. Foy, acting purch. agt., 1,800 ft. Edgewater Park yacht basin bulkhead, from Great Lakes Dredge & Dock Co., Williamson Bldg., Bid B, sheet steel, 150 ft. wide, 200,000 cu. yd. fill, **$183,396;** Bid C, wood piling, 50 ft. wide, 50,000 cu. yd. fill, **$145,589.** J. C. Wenrick, 518 City Hall, engr.

CONTRACTS AWARDED

†California—Bureau Reclamation, Old Post Office Bldg., Sacramento, clearing brush, timber 3 schedules of Shasta reservoir, site, Central Valley Project, Spec. 977, 1 area east of Sacramento River and north O'Brien Creek, 1 area west of Sacramento River, and other area north of Pit River, to E. L. Gates, Portland, Ore., **$381,000.** CD 9/3.

Calif., Seal Beach—Los Angeles City Dpt. Water & Power, 207 S. Bway., Los Angeles, dredging approx. 40,000 cu. yd. in mouth San Gabriel River, near Seal Beach steam plant, Spec. 3967, to Shannahan Bros., 6193 Maywood Ave., Huntington Park. **$26,000.** Bids 9/24, awarded 9/26. H. C. Gardett, 207 S. Bway., Los Angeles, engr.

Md., Baltimore—Bd. Awards, City Hall, maintenance dredging Baltimore Harbor, to Arundel Corp., 2 E. Pratt St. **$47,620.** Bids 9/17. CD 9/15.

Mich., Highland Park (br. Detroit)—Wayne Co. Road Comn., 3800 Barlum Tower, Detroit, retaining wall, pumphouses, Hamilton, 2 and Oakland Sts., for Davison Hy. Project, to Thomas E. Currie Co., 2531 Conner Ave., Detroit. **$45,716.** Est. $120,000. Bids 9/18. CD 9/9.

†Neb., Winnebago—U. S. Eng., 1709 Jackson St., Omaha, excavating 164,000 yd. earth from channel Missouri River to form pilot canal, Browers Bends, hired labor and government plant. **$16,400.**

O., Painesville—Industrial Rayon Corp., **A.** McGervey, purch. agt., W. 98 and Walford **Sts., Cleveland, 1,800 ft. stone breakwater** along Lake Erie, to L. A. Wells Constr. Co., Schofield Bldg., Cleveland. **$75,000.**

★**†Oregon**—U. S. Eng., Pittock Blk., Portland, dredging, disposing 2,353,000 cu. yd. material and furnishing, placing 28,600 cu. yd. riprap to complete forebay and tailrace, Bonneville powerhouse, to General Constr. Co., 3840 Iowa St., Seattle, Wash. **$1,494,195.** Est. $2,463,550. Bids 9/26. CD 9/30—ENR 10/2, under LB.

†Tex., Laredo—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., excavating, filling, draining, etc. grounds, in Military Area, **WPA, $67,285.**

★**†Washington**—Bureau Reclamation, Customhouse, Denver, Colo., power transformers for 3 main generating units in power plant, Grand Coulee Dam, Columbia River, Spec. 938, furnishing six 36,000 kilovolt-ampere transformers for Units L-4 and L-5, to General Electric Co., 1 River Rd., Schenectady, N. Y., **$503,960;** three 36,000 kilovolt-ampere transformers for Unit L-6, to Allis-Chalmers Mfg. Co., 1126 S. 70 St., Milwaukee, Wis., **$151,200.** Bids 7/10. CD 9/16—ENR 9/18.

Ont., Hamilton—National Steel Car Corp., Ltd., Kenilworth Ave. N., dredging channel for intake to J. P. Porter & Sons, Ltd., Fort Wellington St., N., erecting pump house for low lift pumps gravity filtering sys., reservoir at power house, to Canadian Eng. & Contg., Co., Ltd., 25 Hughson St. S. Est. **$45,000.**

★**†Panama**—General Purchasing Officer, The Panama Canal, 1435 K St. N.W., Wash., D. C., furnishing 19,440,000 tons concrete aggregate for Third Locks Project, to The Nevada Constructors, Inc., 330 N. 7 St., Las Vegas, Nev. **$6,880,800.** Bids 9/10. Awarded 9/29. CD 9/16—ENR 9/18.

Sask., Swift Current—Prairie Farms Rehabilitation Admin., 910 McCallum Hill Ridge, Regina, irrigation sys., to G. Spence, 910 McCallum Bldg., Regina, **$135,280.**

UNCLASSIFIED

PROPOSED WORK

Calif., Eureka—CREOSOTED PILE BENTS—Constructing 280 ft. creosoted pile bents in Murray St. G. S. Winzler, City engr.

Calif., Richmond—WHARF—150 ft. sugar wharf addn., replacing 250 ft. decking on present wharf. E. A. Hoffman, city engr.

★**†Fla., Orlando**—AIR CORPS POST—U. S. Eng., P. O. Box 4970, Jacksonville, bids soon second Air Corps post, 95 additional bldgs. $1,250,000.

Idaho, Pocatello—RUNWAYS, etc.—Imprv. runways, complete lighting and drainage facilities, McDougall Field. $53[illegible] WPA funds sought. R. C. Lowrie, City [illegible]ll, engr.

★**Miss., Gulfport**—DISTRIBUTI[illegible] SYSTEMS, etc.—Mississippi Powe[illegible], L. P Sweat, genl. mgr., Bank of Gu[illegible]t Bldg. new distr. sys., auxiliary genera[illegible] plants $3,000,000.

N. J., Bayonne—RECREATIO[illegible] AREA—Recreation area, excavating, [illegible]scaping, drainage, walls, etc. $62,500. W[illegible] H. A. Jaeger, City Hall, owner's and W[illegible] engr.

N. J., Belmar—JETTY and P[illegible]R—Boro, stone, timber, jetty in Ocean, new [illegible] 8 Ave. $70,000. C. W. Birdsall, 1700 F St., engr.

N. J., Newark—RECREATION AREA—Recreation Area, grading, excav., grandstand, fields, etc., Route 25, $80,000. WPA C. Malstrom, Orange and N. 6 St., owner's and WPA engr.

N. J., South Orange—GROUND IMPROVEMENTS—City of Newark, City Hall, ground imprvs., new drains, catch basins, lighting poles, equipment, removing old steel water tower, replacing 20,000 gal. underground tank, sidewalks, etc. Alms House. $61,000. WPA. C. Malstrom, Orange and N. 6 Sts., Newark, WPA and owner's, engr.

N. J., Union—SWIMMING POOL—Union Co., Court House, Elizabeth, swimming pool, Kawameeh Park.

New York—NATURAL GAS DISTRIBUTION—Republic Light, Heat & Power Co., Jackson Blvd., Buffalo, replacements, extens. imprvs. natural gas distr. lines, various locations, western New York area. Over $25,000.

★**New York**—RURAL ELECTRIC LINES—Steuben Electric Assn., Inc., A. Seaman, pres., Hornell, Bernice Shautt, secy., Bath, bids soon 1,200 mi. rural electric lines, Steuben Co. $750,000 REA allot. CD 7/30—ENR 8/7.

New York—WELLS, etc.—Bradley Producing Co., Wellsville and Bolivar, drilling wells, pressure plants, connecting and gathering pipe-lines, etc., Allegany Co. $50,000.

O., Massillon — POWER SUB-STATIONS—Ohio Pub. Serv. Co., Massillon, 2 power substations. $50,000.

Okla., Apache—OIL STORAGE TANK, etc. Texas Co., Philtower Bldg., Tulsa, 80,000 bbl. oil storage tank and pumping plant, tank farm, near here. $40,000.

†Ore., Bonneville—TRANSFORMERS—U. S. Eng., 628 Pittock Blk., Portland, seven 60,000 kva. transformers, for powerhouse on Columbia River., No. 698-42-201.

★**†Ore., Pendleton** — AIRBASE CANTONMENT—U. S. Eng., Pittock Blk., Portland, expansion airbase cantonment, barracks, mess halls, kitchens, warehouses, garages, hospitals, 5 hangars, concrete ordnance igloos, etc. $2,200,000.

Pennsylvania—LIGHT and POWER LINES—Sullivan Co. Rural Elec. Co-op. Inc., W. S. Thomas, supt., Forksville, 40 mi. exten. rural light and power lines, Sullivan Co. $35,000-$40,000.

★**Pa., Johnstown**—AIRPORT—U. S. Eng. Pittsburgh, bids soon, city-county airport, 326 acre site, Richland Twp., for City of Johnstown and Comrs. Cambria Co., Ebensburg, $1,447,989. CAA-WPA. H. Lee Wilson, City Hall, Johnstown, city engr. in charge.

Pa., Wyomissing—TROLLEY TRACK REMOVAL — Boro Council, Wyomissing, and Reading Traction Co., Reading, A. J. Stratton, pres., removing trolley tracks and paving afterwards. $30,000.

Tenn., Chattanooga — PARK IMPROVEMENTS—Mayor, imprv. Patten Island recreational park, $25,000.

Texas — RURAL ELECTRIC LINES — Sam Houston Electric Co-operative, Inc., Livingston rejected bids Sept. 26, 200 mi. rural electric lines, Polk Co. $150,000. Will readvertise. Beavers, Lodal & Wells, Smith-Young Tower, San Antonio, engrs. CD 22—ENR 8/14.

Tex., Alice—AIRPORT—C. D. Jones, mayor, imprv. airport facilities. $255,000. CD 5/14—ENR 5/29.

†Tex., Amarillo—BOMBING RANGE—War Dpt., 20 St. and Constitution Ave., N.W., Wash., D. C., making surveys locating bombing range, facilities, vicinity of here. $350,000 (not incl. acreage or leases, etc.)

Tex., Big Spring—TRUNK LINE EXTENSIONS—Shell Pipe Line Corp., Shell Bldg., Houston, 28 mi. 10 in. steel welded joint pipe trunk line extens. $90,000.

Tex., Orange—FIRE SYSTEM, etc.—A. Sokolski, mayor, rehabilitating fire alarm sys., fire sta., fire sys. imprvs., Tex. 41-374. $50,165. Applied for DPW funds. Steinman & Colemon, Box 3267, Beaumont, archts.

Tex., Port Arthur—PLEASURE PIER, etc.—B. Taylor, city mgr., revised plans 2nd unit pleasure pier, basin work, piers, dredging, etc. $60,000. Total est. $200,000. Bids 9/2 rejected. R. J. Cummins, Bankers Mortgage Bldg., Houston, engr.

Tex., San Antonio—ATHLETIC GROUNDS—C. K. Quin, mayor, athletic grounds, negro recreation center. $72,475. Applied for DPW funds. M. G. Simons, Aztec Bldg., archt.

†Wash., McChord Field—ATHLETIC FIELD—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., clearing 30 acre athletic field, sprinkling sys., cinder tracks, portable bleachers, backstops, etc. $101,528. WPA funds sought.

UNCLASSIFIED (Proposed Work, Cont'd.)

†**Alaska**—PIER—U. S. Eng., Central Bldg., Seattle, Wash., bids soon terminal pier on Passage Canal connection of Alaska R.R.

Alta., Champion — HANGARS — Dominion Govt., Ottawa, Ont., plans by Dpt. Air Defense, Ottawa, Ont., hangars. $150,000. Dpt. Munitions & Supply, Ottawa, Ont., engrs.

★**Alta., Lethbridge**—DAM—Dominion Govt., Ottawa, Ont. and Provincial Govt., Edmonton, Alta., dam on St. Mary's River, near Spring Coulee. $3,000,000.

B. C., Pavilion—AUTO CAMP—I. L. Hislop, Pavilion, auto camp. $50,000.

B. C., Vancouver—DOCK—Columbia Boat Builders, Ltd., 818 Standard Bank Bldg., dry and graving dock. $50,000.

B. C., Vancouver—GAS DEVELOPMENT—F. H. Yeomans, 1040 W. Georgia St., natural gas development, Twp. No. 2 Dist. of New Westminster.

B. C., Victoria—ARENA—Arena Victoria Ltd., 211 Pemberton Bldg., arena. $50,000.

Que., Saguenay — HANGARS — Dominion Govt., Ottawa, Ont., plans by Dpt. Air Defense, Ottawa, Ont., 4 double landplane hangars. $150,000. Dpt. Munitions & Supply, Ottawa, Ont., engrs.

★**Que., Sherbrooke** — POWER DEVELOPMENT—A. Deslauriers, city clk., power plant. $1,500,000. Crepeau & Cote, 45 N. Wellington St., engrs.

BIDS ASKED

Bids Asked After October 8

Wisconsin—RURAL ELECTRIC LINES—Waupaca Electric Co-operative, Iola, H. C. Patterson, supt., 51 mi. rural electric lines, Marathon, Portage and Shawano Counties. $47,000. Wis. Development Auth., 602 Tenney Bldg., Madison, engrs. CD 9/4—ENR 9/18.

Bids Asked October 13

Ont., Clarkson — PUMP HOUSE — British American Oil Co. Ltd., Royal Bank Bldg., Toronto, rein.-con. pumphouse. About $40,000.

Bids Asked October 14

Iowa—RURAL ELECTRIC LINES—Humboldt Co., Rural Electric Co-operative, Humboldt 95 mi. rural transmission lines, Humboldt and Kossuth Counties. $100,000. Stanley Eng. Co., Muscatine, engrs.

Iowa—RURAL ELECTRIC LINES — Humboldt County Rural Electric Co-operative, Humboldt, 94.8 mi. rural electric lines. $99,000. Stanley Eng. Co., Muscatine, engrs. CD 9/10—ENR 9/18.

†**Me., Gerrish Island**—TOWER—U. S. Eng., Park Sq., Bldg., Boston, Mass., concrete tower, Sisters Point, Gerrish Island, 5 mi. east of Kittery.

Bids Asked October 15

†**Fla., Orlando** — AIRFIELD BUILDINGS, etc.—U. S. Eng., MacDill Field, P. O. Box 1407, Tampa, 14 temporary bldgs., flag pole, Orlando Army Air Base.

Wisconsin — ELECTRIC DISTRIBUTION SYSTEM—Buffalo Electric Co-operative, Alma, 48.5 mi. electric distr. sys. in Buffalo, Pepin and Trempeeleau Counties. Wisconsin Development Auth., 110 E. Main St., Madison, engrs. CD 9/4—ENR 8/28.

Bids Asked October 16

†**Wash., Odair**—OIL STORAGE TANKS—Bureau Reclamation, Customhouse, Denver, Colo., furnishing 3 horizontal, welded-plate-steel, oil storage tanks for switchyard oil house, Grand Coulee power plant, Columbia Basin project, Spec. 1566-D.

Bids Asked October 17

New York—BORINGS—President Brooklyn Boro, Boro Hall, Contr. 1, borings, Brooklyn-Queens connecting hy., Navy St. to Kent Ave.-Park Ave.

N. Y., Brooklyn — STATION — Bd. Transportation, 250 Hudson St., New York, Sands St.-Brooklyn Bridge Station, for Myrtle Ave. Elevated R.R. of New York City Transit Sys., BMT Div., Brooklyn Boro.

N. S., Lunenburg—CRANE—Secy. Dpt. P. Wks., Ottawa, Ont., fabrication, del., erecting, testing one 35 ton stationary, electrically operated, gantry type crane, for service on railway wharf, about $75,000. K. M. Cameron, c/o owner, engr.

Bids Asked October 20

La., New Orleans—AIRPORT—U. S. Eng., foot of Prytania St., clearing, grubbing Kenner Airport site, near here. CAA.

Bids Asked October 22

†**Ind., Fort Wayne**—AIR CORP BUILDINGS—U. S. Eng., 613 Federal Bldg., Detroit, Mich., motor repair shop and oil storage house, Army Air Corp Airport, Baer Field; adv. ENR 10/9.

†**Tex., Greenville** — AIRPORT IMPROVEMENTS—U. S. Eng., Citizens Bank Bldg., Denison, airport imprvs., 88 acres clearing and

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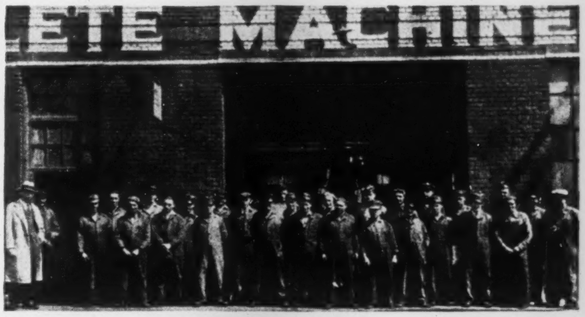

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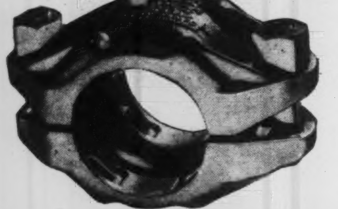

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grubbing, 1,000,000 cu. yd. stripping and excav., replacing 84,000 cu. yd. top soil, etc. CD 9/12—ENR 9/18.

Bids Asked October 23

†Arizona, California, Nevada—BULKHEAD GATES—Bureau Reclamation, Customhouse, Denver, Colo., furnishing, del. three 15 ft. 2 in. x 14 ft. bulkhead gates for turbine draft tubes at Boulder power plant, Boulder Cañyon Project, Spec. 1571-D.

Bids Asked October 23 to 28

Pennsylvania — TRANSMISSION LINES — Adams Electric Co-operative, Gettysburg, C. A. Gluck, supt., 396 mi. transmission lines, Franklin, Cumberland and York Counties. $487,000 REA allot. CD 9/29—ENR 10/2.

Bids Asked October 24

†California—AIR INLET TRANSITIONS—Bureau Reclamation, Customhouse, Denver, Co., furnishing, del. 18 welded-plate-steel, air inlet transitions for tube-valve control piping, Shasta Dam, Kennett Div., Central Valley Project, Spec. 1572-D.

Bids Asked October 28

†Ore., Bonneville—BUSES—U. S. Eng., Pittock Blk., Portland, 15 kv. metal-enclosed buses for Units 7, 8, 9 and 10 also transfer bus exten., Bonneville Dam, Inv. 698-42-202.

Bids Asked About October 29

†Tex., Abilene—AIRFIELD—U. S. Eng., Caddoa, Colo., airfield, 32 tent frames, day rooms, mess halls, officers bldg., administration bldg., dispensary, operations bldg., warehouse, utility sys., water, gas, electric and sanitary sewers, disposal plant.

Bids Asked October 31

Iowa—RURAL ELECTRIC LINES—Pocahontas Co. Rural Electric Co-operative, Pocahontas, 95 mi. transmission lines. $95,000. K. R. Brown, 803 Valley Bank Bldg., Des Moines, engr. CD 10/1—ENR 9/25.

Bids Asked November 3

★**Wash., Tacoma** — TRANSFORMERS and CONDENSERS—Furnishing six 14,000 kva. 115/52.5 and 13.8 kv. O.I.W.C. transformers, two 20,000 kva. 13.8 kv. outdoor air cooled synchronous condensers for tideflat substation installation. CD 9/29—ENR 10/2.

Bids Asked About December 1

†Alaska, Whittier—PIER—U. S. Eng., Central Bldg., Seattle, Wash., 1,500 ft. pier, 5,660 ft. railroad track, etc., on Passage Canal, eastern terminus, Passage Canal connection, Alaska R.R. CD 10/2—ENR 10/9.

Bids Asked

Calif., Willows—RUNWAYS, etc.—U. S. Eng., 208 Post Office Bldg., Sacramento, landing strip, runways, taxiways, apron and appurtenant facilities, Municipal Airport, near here, Inv. 1105-42-16. CD 9/26—ENR 10/2.

LOW BIDDERS

†N. J., Cape May—FUEL DISTRIBUTION SYSTEM—4th Naval Dist., Navy Yard, Phila., Pa., Sept. 25, imprv. west fuel distr. sys., from Bowers Bros., 2015 Sansom St., Phila., Pa., **$148,000.** CD 9/17.

†Washington—STEEL TOWERS—Bonneville Power Admin., P. O. Box 3537, Portland, Ore., Sept. 29, furnishing steel towers for Bonneville-Vancouver Transmission Line 5. Inv. 2237, from Bethlehem Steel Co., 20 and Illinois Sts., San Francisco, Calif., **$339,669.** CD 9/15—ENR 9/18.

CONTRACTS AWARDED

★**†Calif., Merced**—LANDING STRIP, etc.—S. Eng., 208 Postoffice Bldg., Sacramento, landing strip, paving runways, taxiways, etc., Merced Flying School, to Union Paving Co., 310 California St., San Francisco. **$519,274.** CD 7/7—ENR 7/10.

Conn., West Hartford (br. Hartford)—ATHLETIC FIELD IMPROVEMENTS—Town Mgr. Town Hall, water supply, drainage sys., etc., athletic field, Charter Oak Field, Flatbush Ave., to F. B. O'Neil, 22 Preston St., Hartford. **$38,149.** CD 9/26—ENR 10/2.

★**Kan., Pittsburg** — AIRPORT IMPROVEMENTS—W. L. Baldwin, city, clk., airport imprvs., hangar, runways, repair shop, administration bldg., **WPA. $600,000,** J. H. Vincent, city engr.

Me., Oldtown—AIRPORT—U. S. Eng., Park Square Bldg., Boston, exten. NE/SW and NW/SE landing strips, paving runway, to W. H. Hinman Co., North Anson. **$296,500.** Est. $300,000. CAA CD 9/5—ENR 9/11.

★**†Mass., Boston**—PIER, BULKHEAD, etc.—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C. pile and timber pier and bulkhead, to Roy B. Rendle & Co., 364 Border St., East Boston (Sta. Boston) approx. **$1,000,000;** concrete fitting out dock, to J. F. Fitzgerald Constr. Co., 214 Essex St., approx. **$3,000,000.**

N. J., Egg Harbor and **Galloway**—AIRPORT—City of Atlantic City, City Hall, Atlantic City, clearing, excavating, grubbing, asphaltic concrete runways, airport. **WPA. $75,000.** G. R. Swinton, 930 Atlantic Ave., Atlantic City, owner's and WPA engr. CD 9/30—ENR 10/2.

★**N. Y., New York** — TUNNELS — At office New York City Tunnel Auth., A. Jones, chn., 200 Madison Ave., Manhattan tunnels, Brooklyn-Battery Tunnel, to Mason & Hanger Co., Inc., 500 5 Ave. **$13,948,000.** Bids 9/16, awarded 10/2. CD 9/17—ENR 9/25, under I.B.

Oklahoma—TRANSMISSION LINE—Bd. Directors Grand River Dam Auth., Vinita, 33 mi. 66,000 kva. transmission line, from Grand River Dam to Miami, to A. S. Schulman Electric Co., 537 S. Dearborn St., Chicago, Ill. **$184,201.** Bids 9/23, awarded 9/[illegible]. CD 9/[illegible]—ENR 9/18.

Pa., Plymouth—TROUGH, etc.—Glen Alden Coal Co., 19 S. River St., Wilkes-Barre, [illegible] ft. trough from Wadhams Creek to Shawnee Ave. filling in cuts on Plymouth Mountain, to C. W. Wagner Constr. Co., 19 Turner St., Plymouth. Est. **$25,000.**

†Tex., Camp Wolters — BAND STAND, TENNIS COURTS, etc.—Con. Q.M., band stand, tennis courts, dance pavilion, roads, retards and fire lanes, etc., **WPA. $161,993.**

★**†Tex., Midland**—AIR SCHOOL IMPROVEMENTS—U. S. Eng. Denison, additional work, runways, aprons, taxi strips, etc., Air Corps Advanced Flying School, to F. M. Reeves & Sons and Cage Bros., General Delivery, Midland. Approx. **$850,000.** CD 9/26—ENR 10/2.

★**†Tex., Pottsboro**—FLYING SCHOOL—U. S. Eng., Citizens Bank Bldg., Denison, expansion Basic Air Corps Flying School, to R. F. Ball Constr. Co., 300 S. Main St., Fort Worth, and Central Contg. Co., Construction Bldg., Dallas, **$1,375,000.** CD 9/30—ENR 10/2.

†Tex., San Antonio—SWIMMING POOL, etc.—Con. Q.M., concrete swimming pool, filtration plant, chlorinator, etc. Kelly Field, force account, **$26,921.**

Tex., Victoria — PARK, etc. — B. T. Jordan, mayor, municipal park, installing water lines, athletic courts, drainage structures, etc., **WPA. $82,229.** E. F. Miles, Victoria, engr.

★**†Wash., Oak Harbor** — NAVAL AIR STATION—Yards & docks, Navy Dpt., 18 St. and Constitution Ave. N. W., Wash., D. C., bulkheads, filling, grading, clearing, grubbing, pier, 4 seaplane ramps, night lighting facilities, seaplane parking area, seaplane hangars, barracks, mess hall and bakery, for naval air station, Whidberg Island, to Austin Co., 16112 Euclid Ave., Cleveland, O., **$3,540,000,** cost-plus-basis. CD 7/29—ENR 7/31

Wash., Spokane — ROUNDHOUSE IMPROVEMENTS—Great Northern Ry. Co., 175 E. 4 St., St. Paul, Minn., C. M. Nye, ch. engr., roundhouse imprvs. and new Y tracks, force account. **$50,000.** CD 9/5—ENR 9/11.

Wash., Vancouver — PARK IMPROVEMENTS—Clark Co., Court House, imprv. Lewisville Park, near here, shelters, water mains, reservoir, well, etc., **WPA. $63,753.** CD 6/25—ENR 7/3.

★**N. S., Halifax**—TEMPORARY DEPOT BUILDINGS—Dpt. National Defense for Air, Ottawa, Ont., temporary accommodation, Y Depot, R.C.A.F. Station, to Stewart Constr. Co., Ltd., 7 Dufferin St., Sherbrooke, Que. **$500,000.**

N. S., Sydney — PIER — Dpt. National Defense, Ottawa, Ont., mooring pier, to T. C. Gorman (Nova Scotia) Ltd., 1440 St. Catharine St. W., Montreal, Que. **$40,000.**

Ontario—GROUND SERVICES, etc.—Dpt. Munitions & Supply, Ottawa, installing ground services, Intermediate Aerodrome, Taylor, and installing tank and piping, Elementary Flying Training School, London, to Sterling Constr. Co. Ltd., 2492 Sandwich St. E., Windsor, about **$100,000.**

Ont., Edenvale—AERODROME—Dpt. Transport, Ottawa, Ont., aerodrome development, Relief No. 1 to Camp Borden, to Law Constr. Co., Ltd., 225 Sterling Rd., Toronto, about **$152,000.**

Ont., Edenvale—GROUND SERVICES—Dpt. National Defense for Air, Ottawa, Ont., ground services, clearing, grading, drainage, at Relief Intermediate Aedodrome, to Scott-Jackson Constr. Ltd., 57 Bloor St. W., Toronto. **$40,000.**

★**Que., Bagotville**—HANGARS, etc.—Dpt. National Defense for Air, Ottawa, Ont., 4 double landplane hangars, 25 miscellaneous temporary bldgs., for Air Operational Training School to L. G. Ogilvie & Co., Ltd., 225 Walkley Ave., Montreal. **$1,000,000.**

Que., Cartierville—RUNWAY, etc.—Dpt. Transport, Ottawa, Ont., hard surfaced runway and taxiway, clearing, stumping, grading, drainage, airport, to Armand Sicotte & Sons, 1906 Van Horne St., Montreal, about **$132,000.**

Que., Joliette—DAM—Barrett Co., Ltd., 5551 St. Hubert St., Montreal, 200 ft. rein.-con. dam across Assumption River, to Laflamme & Laflamme Ltd., 8500 St. Hubert St., Montreal, **$35,000.**

Que., Kanasuta — DAM — Secretary Hydro-Power Comn. of Ontario, 630 University Ave., Toronto, timber and earth fill dam, clearing out debris, Kanasuta River, to Dominion Constr. Corp. Ltd., Reford Bldg., Toronto, Ont. Est. about **$250,000-$300,000.** Bids 7/25. CD 7/16.

Que., Mont Joli—GROUND SERVICE—Dpt. National Defense for Air, Ottawa, Ont., ground service, No. 9 Bombing and Gunnery School, to J. E. and D. P. Connolly, King St., Bathurst, N. B. **$86,000.**

★**Que., Saguenay**—AIRPORT—Dpt. Transport, Ottawa, Ont., airport development, clearing, stumping, grading, smoothing, hard surface runways and taxi strips, drainage, to Local Construction Co., Ltd., 4740 Iberville St., Montreal, about **$540,000.**

UNCLASSIFIED (Contracts Awarded, Cont'd.)

Sask., Assiniboia — AERODROME — Dpt. Transport, Ottawa, Ont., aerodrome development, clearing, grubbing, grading, etc., for E.F.T. School, to Nelson River Constr. Co., Ltd., 607 Union Trust Bldg., Winnipeg, Man., about **$246,000.**

Sask., St. Aldwyn — AERODROME — Dpt. Transport, Ottawa, Ont., aerodrome development, grading, smoothing, rolling, drainage, runways, hard-surfacing, to Dufferin Paving & Crushed Stone, Ltd., Fleet St. W., Toronto, Ont., about **$27,000.**

PUBLIC BUILDINGS

PROPOSED WORK

†Ala., Montgomery—City, health clinic bldg., Docket Ala. 1-104, $217,100. **DPW.**

Ark., Fort Smith — Sparks Hospital Bd., plans by E. Chester Nelson, Merchants Natl. Bank Bldg., hospital addn. $200,000. CD 6/30—ENR 8/7.

Ark., Hope—Hope Hospital Assn., plans by Wittenberg & Delany, Pyramid Bldg., Little Rock, hospital. $402,639.

Ark., Little Rock—Pulaski Co. Special Dist., plans by Wittenberg & Delany, Pyramid Bldg., imprv., expand school bldgs. $362,681.

Ark., North Little Rock—North Little Rock School Dist., plans by Ginocchio & Cromwell, Hall Bldg., expand school bldgs. $200,000.

†Calif., Long Beach—Div. Defense Housing, FWA, 408 S. Spring St., Los Angeles, 800 homes for families of workers in shipyards, aircraft plant and other defense industries, 90 acre site, lying between State and Williard Sts., west of Santa Ana Ave.

Calif., San Mateo—Housing Auth. of San Mateo Co., W. Johnson, secy., 121 S. Ellsworth St., plans by J. H. Mitchell, 369 Pine St., San Francisco, and L. J. Sharps, 1319 Howard Ave., Burlingame, 34 low rent housing units, Cal. 14-1. $153,000. USHA. CD 4/30—ENR 5/8.

Colo., Denver—Denver Housing Auth., plans by R. H. Ervin, Security Bldg., and J. K. Monroe, Curtis St. and Bway., housing, bounded by 25, 26, Lawrence and Arapahoe Sts. $391,000. CD 9/8—ENR 9/11.

†Colo., Greeley—Farm Security Admin., 1025 14 St., Denver, farm labor camp, 80 living units, admin. bldg., utilities, etc. $160,000.

★**†Conn., Bristol** — Div. Defense Housing, FWA, 18 and F Sts. N.W., Wash., D. C., plans by Douglas Orr, 96 Grove St., New Haven, 200 brick units, Project 6091X. $700,000. CD 7/11—ENR 7/17.

Conn., Glastonbury—Town, Glastonbury Library Assn., c/o Hartford Conn. Trust Co., Trustee, 750 Main St., Hartford, library. $160,000.

†Conn., Groton—Town, plans by E. L. Schofield, Mercer Bldg., New London, school addns., Docket Conn. 6-112, $220,000. **DPW.** CD 9/23—ENR 9/25.

†Conn., Groton—Town, school and school addn., Docket Conn. 6-113. $216,500. **DPW.**

†Fla., Tallahassee—City, hospital facilities, Docket Fla. 8-113. $400,000. **DPW.**

†Ga., Savannah—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., preparing plans barracks, signal tower, radio tower, docks, on Cockspur Island. $200,000. Bradbury & Stockman, William-Oliver Bldg., Atlanta, engrs.

★**†Idaho, Boise**—U. S. Eng., Pittock Blk., Portland, Ore., distributing depot with concrete, steel warehouses, etc., to supply air bases in Pacific Northwest and Alaska, 80 acre site adjoining Gowen Field. $10,000,000.

†Ind., Burns City—Bureau Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., rein.-con. torpedo storage plant, Naval Depot. $130.000.

★**†Ind., East Chicago** — American Steel Foundries, 3761 Canal St., plant for manufacture tank equip., for War Dpt. $3,851,192 for land and buildings, $5,562,709 for machinery and equip. Defense Plant Corp. will finance.

★**†Ind., East Chicago** — Inland Steel Co., 3210 Watling St., plant for manufacture pig iron, annual capacity 900,000 net tons, for OPM. $34,000,000. Defense Plant Corp. will finance.

†Ind., Jeffersonville—School City of Jeffersonville, 2 story high school, Docket Ind. 12-107, $131,700, **DPW.**

†Ind., New Albany—School City of New Albany, new school and schoo laddns., Docket Ind. 12-108, $307,644. **DPW.**

†Ind., Walkerton—Walkerton-Lincoln Twp. Consolidated Schools, high school, Docket Ind. 12-103. $283,000, **DPW.**

★**Ia., Davenport**—Bd. Educ., grade high school addns., elementary school, $619,279. Applied for DPW funds.

Kan., Arkansas City—G. Wylie, mayor, defeated bonds hospital. $175,000. CD 9/3—ENR 9/11.

Kan., Kansas City—Bd. Educ., plans by J. W. Radotinsky, Commercial Natl. Bank Bldg., 2 story school, northern sect., $198,950;

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2 story school, 17 St. and Webster Ave., $233,-800. Applied for DPW funds.

†**Mass., Ayer**—Town, plans by H. E. Mason, 15 Prospect St., Leominster, high school addns., Docket Mass. 19-111. $54,000. **DPW.** CD 9/22—ENR 9/25.

★**Mass., Quincy**—Plans by P. A. & C. Coletta, 168 Dartmouth St., Boston, 5 story, brick, steel hospital addn. $500,000. CD 4/1—ENR 4/3.

†**Mich., Centerline**—City, recreation bldg., Docket Mich. 20-157. $74,501. **DPW.**

Minn., Crookston—Bd. Regents University of Minnesota, R. S. Callaway, purch. agt., Administration Bldg., University Campus, Minneapolis, plans by C. H. Johnston, 715 Empire Bank Bldg., St. Paul, 2 story, bsmnt., brick, tile dormitory, Northwest School of Agriculture. $150,000. CD 1/2—ENR 1/9.

†**Mo., Fort Leonard Wood**—Con. Q.M., recreational center. $32,000. **DPW.**

†**Mo., Independence** — Independence Sanitarium and Hospital, completion interior lower three floors and bsmnt. of hospital, Docket Mo. 23-102. $232,000. **DPW.**

★**Mo., Kansas City**—Kansas City Housing Auth., c/o E. B. Murry, Dirks Bldg., plans by Keene & Simpson, Land Bank Bldg., and Neville & Sharp, Midland Bldg., housing for negroes and one for white tenants. $4,000,000.

†**Mo., Lebanon**—City, recreation bldg., Docket Mo. 23-106. $45,000. **DPW.**

Mont., Bozeman — Montana State College, armory. $250,000. Federal grant sought.

†**Mont., Glendive**—Farm Security Admin., 1025 14 St., Denver, Colo., bids soon farm labor camp, 25 complete farm units. $150,000.

Neb., Gothenburg—C. F. Williams, city clk., power plant and equip. $45,000. A. Weideranders, city engr.

†**N. J., Bendix**—Bendix Aviation Corp., Airport, Bendix, to aeroplane factory imprvs., addns. airport. Defense Plant Corp. will finance.

†**N. J., East Orange**—Bendix Aviation Corp., Airport, Bendix, N. J., aeroplane factory. Defense Plant Corp. will finance.

N. J., Fair Haven—Riverview Hospital, Union St., Red Bank, brick, steel hospital, River Rd. $300,000.

★**N. J., Paterson**—Paterson Housing Auth., City Hall, low cost housing, $1,500,000 USHA.

N. Y., Brooklyn—Dpt. P. Wks., Municipal Bldg., New York, plans by I. Rosenfield, c/o owner, 2 story, 58x190 ft. hospital, 95-113 N. Elliot Pl. $350,000.

★†**N. Y., Ilion**—Ilion Hospital plans by Ross E. Sluyter, 203 North Washington St., Herkimer, hospital alterations and addns., Docket N. Y. 30-108. $159,748. **DPW.** CD 9/23—ENR 9/25.

†**Okla., Oklahoma City**—City, 1 story, recreation bldg., Docket Okla. 34-129. $13,500. **DPW.**

†**Ore., Hermiston**—Public School Dist. 14, alterating existing school and reconditioning portion of another, Docket Ore. 35-102. $8,360. **DPW.**

†**Pa., Middletown**—School Dist., school, Docket Pa. 36-105. $100,000. **DPW.**

†**R. I., North Kingstown** — Town, school, Docket R. I. 37-125, $175,000; school addns., alterations, Docket R. I. 37-129, $48,700. **DPW.** CD 7/23—ENR 7/31.

Tenn., Loudon—Loudon Housing Auth., Loudon, one or more housing. $150,000.

†**Tenn., Nashville**—Davidson County, school, near here, Docket Tenn. 40-106. $142,500. **DPW.**

Tex., Abilene—Bd. Educ. plans by David S. Castle Co., 1 82½ N. 1 St., school (3rd project). $175,000. Applied for PWA funds.

Tex., Bastrop—Bastrop Co., c/o Judge, plans by Page, Southerland & Page, Nalle Bldg. Annex, Austin, 2 story agriculture and warehouse bldg. $40,000.

Tex., Beaumont—South Park Ind. School Dist., C. G. Johnson, plans by Steinman & Colemon, P. O. Box 3267, 2 story, bsmnt., 160x405 ft., brick, hollow tile, stone trim school alterations, addn. (Tex. 41-326). $243,-019. Applied for DPW funds.

†**Tex., Brownsville**—City plans by Wyatt C. Hedrick, 1005 1st Natl. Bank Bldg., Fort Worth, 4 story, stone recreation bldg., Docket Tex. 41-101. $115,200. **DPW.**

Tex., Channel View—Channel View Ind. School Dist., plans by Hedrick & Lindsley, 810 So. Standard Bldg., Houston, 1 story, 55x219 ft. brick, stone school. $150,000. Applied for DPW funds.

Tex., Del Rio—Del Rio Housing Auth., V. D. Curry, chn., revised plans by Phelps & DeWees & Simmons, Majestic Bldg., San Antonio, San Jose Housing Project, 128 units, $488,400. F. T. Drought, Frost Bldg., San Antonio, engr. CD 7/11—ENR 7/17.

★**Tex., Galena Park**—Galena Park Housing Auth., c/o C. N. Brinkley, Galena Park, (1st unit) 200 housing units, 8 mi. below Houston on ship channel. $70[illegible] USHA. Hedrick & Lindsley, Inc., Southern Standard Bldg., Houston, archts. and engrs. CD 4/3—ENR 4/10.

★†**Tex., Garland**—Guiberson Diesel Engine Co., 1000 Forest St., Dallas, bids soon general contract plant for manufacturing radial diesel air-cooled engines for War Dpt. $892,840 for land and buildings, $[illegible]8,257 for machinery and equip. J. Gordon Turnbull Co., c/o owner, engr. and archt. Defense Plant Corp. will finance. CD 9/30—ENR 10/2.

Tex., Huntsville — Sam Houston State Teachers College, Huntsville, plans by H. D. Payne, 3908 Main St., Hudson, classroom bldg., repairing old main bldg., library. $[illegible]25,000.

★†**Tex., Pasadena**—Pasadena Housing Auth., 150 defense housing units, 1 story frame duplexes, for USHA. $600,000.

Tex., San Antonio—C. K. Quinn, mayor, plans by Spillman & Spillman, 402 Hicks Bldg. and L. M. J. Dielmann, 145 North St., 1 story, fire alarm and repair shop bldg. $62,067. Applied for DPW funds.

★**Tex., San Antonio**—C. K. Quinn, mayor, plans by L. M. J. Dielmann, 145 North St., 2 story, West Side Clinic Hospital facilities and 3rd floor addn. to Health Dpt. Bldg. $647,461. Applied for DPW gr.

Tex., Southton—Bexar Co., c/o C. W. Anderson, judge, Court House, San Antonio, plans by Adams & Adams, Insurance Bldg., San Antonio, and Smith, Pitts & Weidner, Maverick Bldg., San Antonio, and bids soon 2 story, brick, stone, rein.-con. hospital, also imprvs. county Hospital plant. $285,000. CD 11/13—ENR 11/14.

★**Tex., Stephenville**—A. & M. College, c/o F. M. Law, pres., College Station, sketches completed by A. C. Finn, Banker's Mortgage Bldg., Houston, agricultural building, boys' and girls' dormitories, John Tarleton College. $650,000. CD 7/23—ENR 7/31.

†**Tex., Texarkana**—Federal Security Agency, 901 Maverick Bldg., San Antonio, community and recreation bldg. Applied for $71,150 DPW funds.

Tex., Texas City—Bd. Educ., c/o H. J. Mikesha, pres., plans by Henry F. Jones and Tabor, Union Natl. Bank Bldg., Houston, high school, Tex. 41-347. $486,297. Applied for DPW funds. CD 8/19—ENR 8/21.

†**Vt., Brattleboro**—American Optical Co., 14 Mechanic St., Southbridge, Mass., plans by M. A. Dyer Co., 8 Beacon St., Boston, Mass., brick, steel, lense grinding plant. $300,000. Defense Plant Corp. will finance. Hayden, Harding & Buchanan, Park Sq. Bldg., Boston, Mass., engrs. CD 8/26—ENR 8/28.

†**Va., Cradock**—Norfolk County School Bd., Portsmouth, school, Docket Va. 44-163. $175,-000. **DPW.**

†**Va., Hampton** — City School Bd., high school addn., Docket Va. 44-132. $161,000. **DPW.**

†**Va., Portsmouth**—City, 2 recreation bldgs., Docket Va. 44-220. $136,000. **DPW.**

Wash., Coupeville—Consolidated School Dist. 204, Island Co., school facilities, Docket Wash. 45-102. $150,000. **DPW.**

†**Wis., Milwaukee**—Globe-Union, Inc., 900 E. Keefe Ave., factory addn. for manufacturing stealite materials. $400,000. Navy Dpt. will finance.

†**Alaska, Anchorage** — Federal Security Agency, 25 and E Sts. N.W., Wash., D. C., recreation bldg., Docket Alaska 50-108. **DPW.**

†**Bermuda, Hamilton** — Federal Security Agency, 25 and E Sts. N.W., Wash., D. C., recreation bldg. addn. and alterations, Docket Bermuda 57-101. $60,900. **DPW.**

Alta., Edmonton—Market bldg. reconstruction. $150,000.

†**T. H., Island of Oahu**—Federal Security Agency, 25 and E Sts. N.W., Wash., D. C., 4 recreation centers, Docket T.H. 51-103. $325,000. **DPW.**

BIDS ASKED

Bids Asked October 13

†**Pa., Monaca**—Beaver County Housing Auth., R. Bennett, chn., Court House, Beaver, 100 defense housing units, Project 63059 X for USHA. A. Martsolf, G. E. Trent & H. Bradley, 9 St. Monaca, archts. CD 9/2—ENR 9/4.

Bids Asked October 14

Ia., Woodward—State, Des Moines; boy's custodial bldg., Woodward State Hospital. $200,000.

N. Y., Sloatsburg—Bd. Trustees, Central School Dist., school. $161,500. Tooker & Marsh, 101 Park Ave., New York, archts. CD 6/10—ENR 6/12.

Bids Asked October 15

Ia., Hawarden—E. H. Erickson, city clk., light and power plant addn. $92,000. Buell & Winter, 508 Ins. Exch. Bldg., Sioux City, engrs. CD 7/2—ENR 7/10.

Mich., Houghton—A. N. Langius, State Administrative Bd., Lansing, 2 story bsmnt., steel, rein.-con., brick, stone chemistry bldg., plain fdn., for State of Michigan College of

Mining and Technology, Houghton. $150,000. Bowd & Munson, 409 Wilson Bldg., Lansing, archts.

Bids Asked October 16

†**Okla., Fort Sill**—Con. Q.M., maintenance and management repair shop bldg. for heavy equip. $55,000.

Bids Asked October 21

†**Calif., San Diego**—Eleventh Naval Dist., foot Bway., 1 story timber frame dental bldg. exten., 1 story timber frame dispensary, paving, outside services, etc., Spec. 10564.

Bids Asked October 23

★**N. J., Fair Lawn**—Bd. Educ., Town Hall, 1 and 2 story, bsmnt., 412 ft. front, 104x143 ft. sides, brick, steel Junior and Senior High School, incl. gymnasium, etc., Berdan Ave. $560,000. Fanning & Shaw, 49 Ward St., Paterson, archts. G. Tanis, 74 King St., Haledon, engr. CD 6/27—ENR 7/3.

Bids Asked October 24

N. J., Burlington — Burlington Housing Auth., L. S. Kaplan, archt., 33 W. State St., Trenton, 90 dwelling units for USHA. $250,000.

Bids Asked About October 25

★†**Wash., Seattle**—Seattle Housing Auth., Central Bldg., 700 unit Gatewood Heights defense housing Project 45053 X, for USHA. $2,100,000.. Extended date. J. L. Holmes & V. Jones, New World Life Bldg., archts. D. C. Griffin, Lloyd Bldg., engr. CD 9/9—ENR 9/11.

★†**Md., Sparrows Point (br. Baltimore)**—Bethlehem Steel Co., excav., piling, concrete fdns. for steel plant exten. Superstructure plans in progress. $3.500,000. Government will finance. CD 8/11—ENR 8/14.

B. C., Esquimalt—McCarter & Navine, archts., 1930 Marine Bldg., Vancouver, 50 bungalow type dwellings, for Wartime Housing, Ltd., 55 York St., Toronto, Ont. CD 9/23 —ENR 9/25.

LOW BIDDERS

Calif., Richmond—Richmond Housing Auth., W. J. Richards, Jr., chn., 271-10 St., Sept. 26, Triangle Court, 100 unit housing, Cal. 10-1, from L. C. Dunn, Monadnock Bldg., San Francisco. **$290,400.** CD 9/16—ENR 8/21.

†**Me., Bangor**—U. S. Eng., Park Sq. Bldg., Boston, Mass., Oct. 2, post headquarters bldgs., Army Air Corp, Bangor Air Field, from D. A. Sullivan & Sons, Inc., 78 Main St., Northampton, Mass. **$70,293.** CD 9/25.

★†**Md., Middle River (br. Baltimore)**—Farm Security Admin., The Mall between 12 and 14 Sts., S.W., Wash., D. C., Oct. 3, 1,100 defense housing units, incl. 100 duplex and 1,000 single shelters, from National Garden Homes, Inc., Empire State Bldg., New York, N. Y. **$2,891,000.** CD 9/24—ENR 10/2, under Baltimore.

†**N. J., Belleville**—Insolantite, Inc., 343 Cortlandt St., 3 story, part bsmnt., penthouse, 100x200 ft., rein.-con. manufacturing plant also altering existing bldg., for War Dpt., from John W. Ryan Constr. Co., 369 Lexington Ave., New York, N. Y., $322,000. Defense Plant Corp. will finance. CD 9/8—ENR 9/11.

†**O., Cleveland**—National Advisory Com. for Aeronautics, E. Strong, constr. administrator, Langley Field, Hampton, Va., Sept. 26, central heating plant, Cleveland Airport, from Schirmer Schneider Co.. 2709 Detroit Ave., **$138,700.** CD 9/17.

†**Pa., East Rochester**—Beaver County Housing Auth., 119 9 St., Monaca, Oct. 3, 75 defense housing units, Project 36057 X, for USHA, from Westmoreland Constr. Co., 622 W. Pittsburgh St., Greensburg, **$369,183.** CD 9/26.

CONTRACTS AWARDED

★†**Calif., Benicia**—Con. Q.M., Fort Mason, warehouse ordnance machine shop, cleaning and preserving materials warehouse, utilities, Benicia Arsenal, to Leo Epp Co., 4745 Geary Blvd., San Francisco. **$551,202.** CD 6/13—ENR 6/19, under LB.

★**Calif., Los Angeles**—Los Angeles City Housing Auth., 1031 S. Bway., 165 unit Avalon Gardens housing, Calif. 4-9, to E. C. Nesser Co., 4822 W. Jefferson Blvd. **$542,800.** Bids 9/4, awarded 10/4. CD 9/16—ENR 9/18.

★†**Calif., Oakland**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., supplemental contract additional construction Port of Embarkation Supply Depot, warehouses, miscellaneous structures, etc., to Army Post Contractors, Inc., 1501 Maritime St. **$5,000,000.** Additional to 6/17—ENR 6/19, under CA.

★†**Fla., Camp Blanding**—Con. Q.M., miscellaneous bldgs., to Watt & Sinclair, Inc., Palm Beach. **$546,064.** Awarded 10/3.

★†**Ga., Atlanta**—War Dpt., 20 St. and Constitution Ave. N.W., Wash. D. C., administration bldg., Atlanta General Depot, to A. K. Adams & Co., 542 Plum St. N.W. **$671,920.**

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PUBLIC BLDGS. (Contracts Awarded, Cont'd.)

★†**Ind., South Bend**—Mutual Ownership Defense Housing Div. FWA, 18 and F Sts. N.W., Wash., D. C., 250 defense housing units, Project 12022 X, to Henke Constr. Co., 200 E. Walton St., Chicago, Ill. **$910,903.** Awarded 10 /1. CD 6/3—ENR 6/12.

†**Kan., Junction City**—Pub. Bldgs. Admin., 9 and D Sts. S.W., Wash., D. C., 40 defense housing units, Project 140128, to Busboom & Rauh, Salina, **$163,500.**

Md., Baltimore—Md. National Guard, 5th Reg. Armory, 2 story, bsmnt., 104x198 ft., brick, stone, concrete Naval Militia Armory, Key Hy., **WPA. $250,000.** L. P. Sangstrom, 2402 Forest Park Ave., archt., Buckler & Fenhagen, 325 N. Charles St., assoc. archts.

★†**Md., Baltimore**—Baltimore Housing Auth., 709 E. Eager St., 200 defense housing units for USHA, Project 18098-X, to John K. Ruff Co., 100 West 22 St., Baltimore, **$582,800*****plumbing, utilities, sewer, water, gas, etc., to J. H. Bodinger Co., Inc., 530 10 Ave., New York, N. Y., **$124,900*****heating to Somaron Sheet Metal Wks., 434 East 165 St., New York, N. Y., **$36,949*****electrical work to Enterprise Electric Co., 4 W. Barre St., Baltimore, **$24,845*****lawns, planting, etc., to Greenbrier Farms, Inc., Great Bridge Rd., Norfolk, Va., **$16,344.** Grand total $785,838. Bids 9/11. CD 9/15—ENR 9/25.

†**Md., Curtis Bay-Fairfield (Sta. Baltimore)**—Baltimore Housing Auth., 709 E. Eager St., Baltimore, plumbing for 500 defense housing units, Project 18097 X for USHA, to J. H. Bodinger Co., Inc., 530-10 Ave., New York, N. Y., **$288,700**; heating, to Carroll Sheet Metal Wks., 46-10 70 St., Winfield, N. Y., **$88,500*****electrical work. to Enterprise Electric Co., 4 W. Barre St., Baltimore, Md., **$56,375*****landscaping, to State Contg. Co., Inc., 3600 Roland Ave., Baltimore, **$29,800.** Grand total $463,-375. Bids 9/8. CD 9/25—ENR 10/2, under CA.

†**Mass., Chelsea**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., remodeling brick, steel marine hospital, to John F. Griffin Co., 238 Main St., Cambridge. **$340,000.** CD 9/30—ENR 10/2.

†**Mass., Wrentham**—Wrentham Products Co., Depot St., 1 story, 100x125 ft. brick, steel airplane parts factory, for Navy Dpt., to Brown & Matthews, Inc., 122 E. 42 St., New York, N. Y. Est. **$442,258** plant and equip. Defense Plant Corp. will finance. F. Burton Mitchell, 9 Mechanic St., Foxboro, engr. CD 9/30—ENR 10/2.

Minn., Windom—M. Peterson, city clk., turbine generator and condenser, for light and power plant imprvs., to Elliott Co., 220 Baker Bldg., Minneapolis. **$53,100;** cooling tower, to Marley Co., 205 Wesley Temple Bldg. Minneapolis. **$13,060.** Bids 9/29. CD 9/10.

★†**Miss., Biloxi**—Biloxi Housing Auth., 175 defense housing units, Air Corps Technical School, Miss. 2203-X, for USHA, to R. P. Farnsworth & Co., Inc., 1515 S. Salcedo St., New Orleans, La., **$596,319.** Bids 8/20. CD 9/3—ENR 9/11.

★†**N. J., Bellmawr**—Mutual Ownership Defense Housing Div. FWA, 7 and D Sts. S.W., Wash., D. C., one hundred seventy-five 1 and 2 story frame homes, Project 28042X, to A. J. Paretta Contg. Co., 43-45 St., Long Island City, N. Y. **$2,023,000.** CD 9/23—ENR 9/25.

N. Y., Eldred—Bd. Educ., Central School Dist., school, to Rathgeb Walsh Co., Inc., 184 N. Main St., Portchester, **$163,900.** Bids 9/26. CD 9/10—ENR 9/18.

★**O., Toledo**—Toledo Metropolitan Housing Auth., A. G. Spieker, chn., 392 Nebraska Ave., 212 unit, Ravine Park Village housing, Project Ohio 6-3, to J. H. Berkebile & Sons, Inc., 998 Whittier St., **$849,200.** USHA. Bids 9/4. CD—9/12—ENR 9/18.

★†**Pa., Erie**—General Electric Co., 1 River Rd., Schenectady, N. Y., and Erie Wks., H. L. R. Emmet, wks. mgr., Erie, 200x450 ft. brick, steel, concrete plant addn., Bldg. 13, for production naval equip. for Maritime Comn., to United Engineers & Constructors, Inc., 1401 Arch St., Phila. **$1,470,769** for land and buildings, **$5,292,811** for machinery and equip. Defense Plant Corp. will finance. CD 9/15—ENR 9/18.

★†**Pa., Pottstown**—Jacobs Aircraft Engine Co., supplemental contract design and construction engine factory for War Dpt., to Ford, Bacon & Davis, Inc., 39 Bway., New York, N. Y. **$3,000,000.** Defense Plant Corp. will finance. Additional to CD 7/18—ENR 7/24, under CA.

†**Pa., York**—National Youth Admin., 15 St. and New York Ave., Wash., D. C., 1 story, glass, steel machine shop, Girard Ave. and E. Maple St., NYA labor and separate contracts. **$75,000** incl. equip. CD 6/23—ENR 9/25.

Tex., Fort Worth—S. H. Bothwell, city mgr., 1 story, 200x371 ft., brick, tile, concrete, steel warehouse, 1 story, 50x235 ft. Street Dept. sheds, 1 story, 50x150 ft. Sewer and Signal Dept. sheds, 1 story, 50x120 ft. and 30x352 ft. garbage sheds, 25x50 ft. garbage assembly rooms, NYA labor. **$165,000.** P. M. Geren, 806½ Burnet St., archt.

†**Tex., Garland**—Southern Aircraft, Inc., 3rd addn. to aircraft equip. mfg. plant to Henger Constr. Co., Dallas Bank Bldg., Dallas, approx. **$132,600.** Defense Plant Corp. will finance. CD 9/25—ENR 10/2.

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PUBLIC BLDGS. (Contracts Awarded, Cont'd.)

★ **†Utah, Ogden**—U. S. Eng., 751 S. Figueroa St., Los Angeles, Calif., supplemental contract warehouse, facilities, Hill Field, to Peter Kiewit Sons Co., 2667 Leavenworth St., Omaha, Neb. **$669,855.** Additional to CD 5/20—ENR 5/22. under CA.

†Va., Fairfax—Fairfax Housing Auth., Fairfax 160 defense housing units for USHA, Project 44137X, to Case Constr. Co., Berth 109, San Pedro, Calif. Est. **$180,000.** Wallace Neff, 5927 Franklin Ave., Hollywood, Calif., archt. CD 9/11.

Sask., Moose Jaw—Dpt. National Defense for Air, Ottawa, Ont., aircraft assembly plant, for Prairie Airways Ltd., Moose Jaw Airport, to Carter-Halls-Aldinger Co. Ltd., Royal Bank Bldg., Winnipeg, Man. **$250,000.**

Sask., Saskatoon—Secy. Dpt. Munitions & Supply, Ottawa, Ont., barracks, mess room, etc., Initial Flying Training School, to A. W. Heise & Co., Ltd., 502 Grain Bldg. About **$375,000.** CD 9/18—ENR 9/25.

COMMERCIAL BUILDINGS

PROPOSED WORK

Conn., Greenwich—L. J. Martin, North St., T. H. Raynor, agt., 72 West Putnam St., plans by E. G. Wallace, Hollow Tree Ridge Rd., Darien, 10 homes, North St. $200,000.

Conn., New Britain—St. Ann's Roman Catholic Church, 47 Clark St., soon lets contract, superstructure 1 story, 55x146 ft., brick, steel, stone church. $155,000. A. J. DePace, 151 W. 45 St., New York, N. Y., archt.

Ind., Speedway City (br. Indianapolis)—Home Owners Constr. Co., 432 Insurance Bldg., Indianapolis, 30 or more homes. $180,000.

Ia., Burlington—Sisters of St. Francis, Clinton, plans by D. D. Morgan, Burlington, Mercy Hospital School of Nursing. $200,000. Applied to PWA.

Ia., Sioux City—Morningside College, E. Roadman, pres., 3 bldgs. $450,000.

Md., Baltimore—Johns Hopkins Hospital, Monument St. and Broadway, plans by J. R. Edmunds, Jr., 409 Calvert St., nurses home addns., 2 story top addn. on 6 story wing, and 5 story addn. south of main bldg. $300,000.

Mich., Ypsilanti—Noble College Heights, Inc., C. Noble, in charge, Ypsilanti, plans by C. Noble, Ann Arbor and 4484 Cass St., Detroit. 34 houses, Collegewood Dr., $170,000.

Neb., Omaha—Omaha Masonic Home for Boys, 2137 S. 33 St., home at 52 St. and Ames Ave. $160,000.

Nev., Las Vegas—R. W. Dougherty, et al., 4327 Kansas St., San Diego, Calif., housing development, Las Vegas-Boulder City Hy., near here $150,000-$250,000.

N. J., Cliffside Park—Homes Constr. Corp., 32 Journal Sq., Jersey City, 1 story, bsmnt., 106x135 ft., brick, concrete block food market, Lawton Ave. $50,000.

N. J., Dumont—M. M. Reznick, 565-5 Ave., New York, N. Y., 35 two story, bsmnt., 24x34 ft., brick, frame homes development, Washington Ave. $210,000.

★ **N. J., Millington**—National Garden Homes Corp., 350 5 Ave., New York, N. Y., plans by L. Kurtz, 15 W 44 St., New York, N. Y., one hundred fifty 1½ story, bsmnt. homes, Fairlawn Ave. $750,000.

N. Y. Brooklyn—J. H. Bldg. Corp., 80 Lefferts, Ave., plans by Seelig & Finkelstein, 153 Pierrepont St., 6 story, 120x122 ft. apartment, 2052 Ocean Ave. $250,000.

N. Y., Forest Hills—S. Leider, 108-17 67 Ave., plans by M. Rothstein & Son, 391 Fulton St., Brooklyn, 6 story apartment, 99-19 67 Rd. $250,000.

N. Y.. New York—Two Hundred and Forty-Five East Thirty Seventh Street, Inc., 2015 Foster Ave., Brooklyn, plans by W. T. McCarthy, 44 Court St., Brooklyn, 6 story, 80x108 ft. apartment, 685 2 Ave. $160,000.

N. Y., New York—Van Cortlandt Gardens, Inc., 349 E. 149 St., plans by H. Ginsbern, 205 E. 42 St., 6 story, 66x161 ft. apartment, Van Courtlandt Ave. and Bailey Ave. $300,000.

O., Cleveland—St. Lukes Hospital, W. F. Bingham, pres. Bd. Trustees, E. 116 St. and Shaker Blvd., soon lets contract 3 story, bsmnt., brick, rein.-con. slab service bldg. $150,000. C. Merrill Barber, 2341 Carnegie Ave., engr.

Tex., Corpus Christi—Corpus Christi YMCA, c/o D. T. Pool, chn Bd., rejected bids Sept. 23, YMCA bldg. $150,000. O. F. Johnson, 915 Bayview St., archt. F. T. Drought, Frost Bldg., San Antonio, engr. CD 9/17—ENR 9/25.

Tex., Grand Prairie—Bailey C. Johnson & Associates, Kaufman Rd., Dallas, dwellings, utilities, 92 acre tract.

Tex., Grand Prairie—R. H. Clem, Mercantile Bldg., Dallas, 90 one story, frame dwellings. $270,000.

Wis., Beloit—R. Levine & Co., 1235 S. Wabash St., Chicago, Ill., 50 houses, $3,900-$4,300 ea.

BIDS ASKED

N. J., Paterson—Broadway Baptist Church, 537 Bway., 2 story, bsmnt., irregular sized, brick, stone side addn. to church for Sunday school, etc., Bway. $215,000. F. J. Vreeland, 140 Market St., archt. CD 10/8/40—ENR 10/10/40.

Tex., Houston—River Oaks Corp., River Oaks Blvd., Houston, 1 story, rein.-con., steel, tile, stucco, community center bldg., W. Gray St. at River Oaks Theatre. $150,000 or more. W. G. Farrington, 1719 Sunset Blvd., archt.

LOW BIDDERS

Wis., Milwaukee—Catholic Archdiocese of Milwaukee, 2006 W. Wisconsin Ave., reconstructing St. Johns Cathedral, from H. Schmitt & Son, Inc., 930 E. Burleigh St. Est. **$300,000.** E. Brielmaier & Sons Co., 735 W. Water St., archts. CD 5/5—ENR 5/15.

CONTRACTS AWARDED

Calif., Beverly Hills—Harrison Cordingly Inc., 9615 Brighton Way, 2 story medical building, Bedford Dr., Brighton Way, to J. N. Conway, 1142 Glendon Ave., West Los Angeles, approx. **$200,000.** W. D. Coffey, 649 S. Olive St., Los Angeles, engr.

Calif., Brisbane—H. Sundberg, 407 Urbano Dr., San Francisco, 1 story, wood frame homes, Schwerin Addn., Bayshore City, near here, day labor. Over **$150,000.**

Calif., Menlo Park—West Coast Houses, Inc., 1608 El Camino Real, Santa Clara, home development, here and vicinity, day labor. Over **$150,000.**

Calif., San Francisco—R. J. O'Brien, 520 Geary St., 1 story, wood frame residences, vicinity Seal Rock Dr., day labor. Over **$150,000.**

Calif., Van Nuys—Fidelity Builders, 3700 W. Victory Blvd., Burbank, 119 frame, stucco dwellings, Denny, Riverton and Satsuma Sts., to C. R. Frantz, 2305 Observatory St., Los Angeles, approx. **$400,000.**

Calif., Vallejo—L. Curtola, 500 Lincoln Hy., miscellaneous business structures, general stores, restaurants, etc., vicinity Mare Island Navy Yard, day labor. Over **$150,000.**

Ind., Indianapolis—Bridges & Graves Constr. Co., Architects and Builders Bldg., 25 houses, Brockton and Sylvan Estates subdivision, own forces. **$200,000** or more. C. D. Ward, Architects and Builders Bldg., archt.

N. J., Fairlawn—Ambrose & Voska, Plaza Rd., 60 two story, bsmnt., brick veneer on frame homes development, Plaza Rd. separate contracts. **$300,000.** A. Palmieri, 254 E. Ridgewood Ave., Ridgewood, archt.

N. Y., Rochester—Browncroft Gardens, Inc., c/o C. S. Barrows, archt., 217 East Ave., apartment houses, to F. Bieger, 829 Highland Ave. Est. **$300,000.**

N. Y., Salamanca—Schine Enterprises, 40 N. Main St., Gloversville, theatre and store, Main and Clinton Sts., to Benz Eng. Co., 29 Main St. Est. **$150,000.** Bids 6/26. CD 6/19—ENR 6/26.

★ **N. Y., Valley Stream**—Corporation, c/o J. Newman, 218 St. and 116 Ave., St. Albans, 80 residences. Owner builds. **$500,000.** J. E. Cahill, 89-64-163 St., Jamaica, archt.

★ **Pa., Phila.**—Irons & Reynolds, Inc., 44 Nassau St., Princeton, N. J., 250 residences, separate contracts. Over **$750,000.** R. Evans, 140 Nassau St., New York, N. Y., archt.

Tenn., Memphis—Southern Bell Telephone & Telegraph Co., c/o F. Flournoy, dist. mgr., 197 Court Ave., 3 story and 6 story, rein.-con., brick, hollow tile telephone bldg., to Barge-Thompson Co., 136 Ellis St. N.E., Atlanta, Ga., **$350,000.**

★ **Wash., Manette**—Olympic Building & Supply Corp., c/o R. W. Miller, Central Bldg., Bremerton, 100 houses 2 mi. north of here, day labor. **$500,000.** CD 9/2—ENR 9/4.

INDUSTRIAL BUILDINGS

PROPOSED WORK

Ark., Ft. Smith — WAREHOUSE, etc. — Harding Glass Co., 2524 N. 11 St., warehouse and cutting room for glass factory. $100,000. Bassham & Wheeler, Kennedy Bldg., archts.

Ark., Hope—MILL—Brunner-Ivory Handle Co., Hope, rebuilding mill, destroyed by fire. $60,000.

★ **Ark., Siloam Springs**—PLANT—Pet Milk Co., Arcade Bldg., St. Louis, Mo., G. Koger, Siloam Springs, local mgr., evaporated milk mfg. plant. $500,000.

Calif., Corona—PACKING HOUSE—Orange Heights Orange Assn., rebuilding 1 story, wood frame packing house, recently destroyed by fire.

Calif., San Francisco — PLANT — Western Stopper Co., 25 St. and Protrero Ave., plant addns. $40,000.

Calif., San Mateo—MARKET, etc.—D. Bohannon, 1182 Market St., San Francisco, market and general food store. $150,000.

Calif., Willits—MILL—Sage Land & Improvement Co., Willits, lumber mill. $40,000.

Conn., East Port Chester—WAREHOUSE—Life Savers, Inc., G. W. Posthill, mgr., N. Main St., Port Chester, N. Y., soon lets contract, 1 story, bsmnt., 95x220 ft., brick warehouse, Davis and Riverdale Aves. $62,000. Lockwood Greene Engineers, Inc., 10 Rockefeller Plaza, New York, N. Y., engrs. CD 10/2—ENR 9/18.

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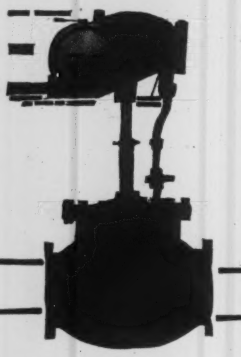

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INDUSTRIAL BLDGS. (Proposed Work, Cont'd.)

Conn., Hartford — WAREHOUSE — G. Fox & Co., Inc., brick, steel warehouse, Market and Morgan Sts. $100,000.

Conn., Waterbury—POWER PLANT, etc.—Waterbury Hospital, Bd. Trustees, Robbins St., plans by Coolidge, Shepley, Bulfinch & Abbot, 1 Court St., Boston, Mass., brick, steel power plant and laundry unit. $175,000.

★**Ill., East St. Louis** — PLANT — Socony-Vacuum Oil Co., Inc., S. 20 St., East St. Louis, and 26 Bway., New York, N. Y., toluene manufacturing plant. $1,000,000, incl. equip.

Ia., Des Moines—FACTORY—Sargent & Co., 411 E. Grand St., soon lets contract, factory, $100,000.

Md., Baltimore—WAREHOUSES, etc.—Texas Co., 400 Asiatic Ave., 20x40 ft. and 120x134 ft. warehouses, 44x98 ft. office bldg., brick, corrugated iron walls, concrete fdn. $75,000. Owner's Engineering Dept., 135 E. 42 St., New York, N. Y., engrs.

Mass., Malden (br. Boston)—WAREHOUSE—Parsons & Wait, archts., 234 Boylston St., Boston, soon lets contract, brick, steel warehouse addn. for Wadsworth Howland Div. Devoe & Reynolds Co., Inc., Green St. $40,000 or more. Cleverdon, Varney & Pike, 46 Cornhill, Boston, engrs. CD 7/15—ENR 7/17.

Mich., Battle Creek — FACTORY — McKay Food Div. of National Biscuit Co., Battle Creek, plans by A. B. Chanel, 9 Merwood Dr., 3 story, 120x135 ft., brick, steel, rein.-con. factory. Approx. $150,000.

Minn., St. Paul—PLANT—Minneapolis-Moline Power Implement Co., Hopkins, remodeling 142x534 ft. plant for manufacture of shells, 3200 Como Ave. S.E.

Mo., St. Louis—FACTORY—Gardner Pocket Book Mfg. Co., P. A. Gardner, 1906 Pine St., factory, Vandeventer Ave. $40,000 incl. equip.

N. J., Lodi — FACTORY — Fabian Textile Ptg. Co., Dell Glen Ave., plans by J. T. Camlet, 667 Main Ave., Passaic, 1 story, 35x40 ft., brick, steel factory addn., alterations, Glen Ave. Over $40,000.

N. J., Newark—PLANT—Purolator Products, Inc., 365 Frelinghuysen Ave., soon lets contract, 1 story, 100x155 ft., brick, concrete, top addn. to oil filter factory. $90,000. William Newmann & Sons, 587 Summit Ave., Jersey City, archts. CD 10/6.

N. J., Perth Amboy—WAREHOUSE—E. I. DuPont de Nemours Co., 71 Buckingham Pl., 2 story, bsmnt., 40x80 ft., steel, brick, storage warehouse, extensive alterations existing Warehouse 27, Buckingham Pl.

N. J., Ridgefield — FACTORY — Superior Marking Machine Co., 451 Lispenard St., New York, factory on 200x200 ft. site, Grand Ave. $50,000

N. C., Durham — WAREHOUSE — Colonial Stores, c/o D. Pender Stores, Durham, brick, rein.-con., concrete block warehouse. $300,000.

N. C., Fayetteville—FREIGHT STATION—Atlantic Coast Line R.R., 71 Bway., New York, N. Y., J. E. Willoughby, Wilmington, ch. engr., rebuilding freight station. Over $40,000.

O., Cleveland—FACTORY — Globe Machine & Stamping Co., R. S. Geddes, pres., 1250 W. 76 St., 1 story, brick, concrete factory addn., alterations. $40,000. E. McGeorge & W. R. Hargett, 9400 Quincy Ave., engrs.

★**Pa., Erie**—PLANT—Erie Lighting Co., 20 W. 10 St., imprv. Lake Front plant. $3,000,0000.

Tex., Garland—PLANT—Craddock Mfg. Co., Garland, canning plant. $40,000.

★**Tex., Gilmer**—POWER PLANT MACHINERY—Farmers Electric Co-operative, c/o H. P. McGaughy, pres., rejected bids Sept. 2, power plant machinery. $550,000. Will readvertise. Freese & Nichols, 407 Capps Bldg., Fort Worth, engrs. CD 9/8—ENR 9/11.

Wash., Tacoma — WAREHOUSE — Standard Carton Co., 2611 Pacific Ave., rebuilding warehouse, destroyed by fire. $40,000.

Wis., Cedar Grove—FACTORY—Cedar Grove Community Corp., Cedar Grove, soon lets contract, 1 story, bsmnt., 78x140 ft., brick, steel, shoe factory addn. Huth & James Shoe Mfg. Co., Cedar Grove, lessees. F. F. Drolshagen, 647 W. Virginia St., Milwaukee, archt.

★**Wis., Genoa**—PLANT—Tri-State Power Co-operative, J. N. Gundershaug, mgr., 312 Rivoli Bldg., La Crosse, soon lets contract, superstructure power plant addn. Total est. $800,000. R. A. Wank, c/o Tri-State Valley Auth., Knoxville, Tenn., archt. Rural Line Engineers, Central Bldg., Clayton, Mo., engrs. CD 8/20—ENR 8/28.

Alta., Drumheller—POWER PLANT—Canadian Utilities, Ltd., Drumheller, power plant. $100,000.

B. C., Kamloops—PLANT—Kamloops Packing Co., Ltd., 605 Munro St., canned goods, condiments, etc. plant. $50,000.

B. C., Mission City—LUMBER MILL—Riverside Lumber Co., Ltd., Mission City, lumber mill, on 2 acre site.

B. C., Vancouver—PLANT—Pacific Glucose Refinery, Ltd., 409 Rogers Bldg., plant. $50,000.

B. C., Vancouver—PLANT—Patterson Boiler Wks., Ltd., 809 Yorkshire Bldg., machinery, equip., etc., manufacturing bldg. $50,000.

B. C., Vancouver—PLANT—Petra Oils Ltd., 404 Rogers Bldg., oil producing and refining plant. $50,000.

B. C., Vancouver—MILLS—[illegible] Lumber Co., Ltd., 75 E. Pender St., logging and shingle mills. $40,000.

B. C., Vancouver—MILL—Vancouver Dry Kiln Co., Ltd., 850 W. Hastings St., mill. $40,000.

B. C., Vancouver—MILL—[illegible] Logging Co., Ltd., 918 Rogers Bldg., logging and saw mills. $40,000.

N. B., Minto—HYDRO PLANT—N. B. Electric Power Comn., Saint John, hydro-plant exten.

Ont., New Toronto — PLANT — Werner G. Smith, Ltd., 134 Royce Ave., Toronto, manufacturing plant. $90,000.

Ont., Oshawa — PLANT — Duplate Safety Glass Co., Oshawa, brick, steel, concrete plant. $300,000.

Ont., Pembroke—MILL—Consolidated Paper Corp., 156 Pembroke St., brick, concrete lumber mill. $90,000.

Ont., St. Thomas—PLANT—Owner, c/o P. H. Short, London, remodeling old brewery for industrial purposes. $50,000.

Ont., Toronto—PLANT—Amalgamated Electric Ltd., 384 Pape Ave., plant exten. $50,000.

Ont., Toronto — PLANT — Canada-Illinois Tool Co., Ltd., 21 Sherbourne St., plant addn. $40,000.

Que., Beauharnois—PLANT—Howard Smith Paper Mills, 407 McGill St., Montreal, bids soon plant addn. $100,000.

Que., Dorval—PLANT—Construction Equipment Co., Ltd., 180 Vallee St., Montreal, equip. repair plant. $50,000.

Que., Jonquiere—PLANT—Leclerc & Houde, 56 Bridge St., bottling and aerated water manufacturing plant. $42,000.

Que., Lachine — PLANT — Canadian Allis-Chalmers Ltd., 25 St. Joseph St., bids soon plant exten. $50,000.

Que., Longueil—PLANT—H. Guerretto, 1880 Papineau Ave., Montreal, plans by P. H. Lapointe, 5038 Victoria Ave., Westmount, plant. $40,000.

Que., Sherbrooke—PLANT—Classon Knitting Mills, Ltd., 14 S. Wellington St., plant addn. $40,000. Architect, c/o B. Math, 14 S. Wellington St., archt.

Que., Sherbrooke — FOUNDRY — Manganese Castings Ltd., 2 Howard St., foundry exten. $40,000. Engineer, c/o H. R. Neville, 2 Howard St.

Que., Sherbrooke—PLANT—J. Pick, c/o A. DesLauriers, City Hall, textile plant. $40,000.

BIDS ASKED

Bids Asked October 13

★**Md., Hagerstown**—AIRPLANE FACTORY—Fairchild Engine & Airplane Corp., Hagerstown, airplane factory addns. $1,675,967. Albert Kahn & Associates, 345 New Center Bldg., Detroit, Mich., engrs.

Bids Asked

Calif., Los Angeles—STOREHOUSE—Consolidated Steel Shipbuilding Co., north end West Basin, Los Angeles Harbor, (selected list bidders) 100x500 ft., wood frame storehouse, west basin, Los Angeles Harbor. Over $100,000.

Calif., Salinas—WAREHOUSE—C. E. Butner, archt., 7 Winham St., 1 story, 95x120 ft., rein.-con. warehouse and bottling plant, for Coca Cola Bottling Co., Salinas. CD 9/23—ENR 9/25.

Calif., Salinas—GARAGE, etc.—C. E. Butner, archt., 7 Winham St., concrete, brick garage and shop addns., for Voss Motor Car Co., Salinas. $40,000.

O., Cleveland — FACTORY — Apex Electric Mfg. Co., J. L. Thomas, company engr., in charge constr., 1070 E. 152 St., 1 story, 145x325 ft., brick, steel factory addn. $125,000.

Okla., Allen—PLANT—Sunray Oil Corp., 1 Wall St., New York, N. Y., aviation gasoline plant. $300,000.

Wis., Ripon—FACTORY—Ripon Foods, soon lets contract 2 story, bsmnt., 75x176 ft., concrete factory addn. R. A. Sutherland, 259 E. Wells St., Milwaukee, archt.

Ont., Niagara Falls—FACTORY—Thomas O. Oliver, Ltd., Niagara Falls, 1 story, 45x105 ft. concrete block factory, Buttrey Ave. About $45,000.

CONTRACTS AWARDED

Calif., Berkeley—FACTORY—A. E. Latham, 3 and Camelia Sts., 1 story factory, to J. B. Peterson & Son, 4021 Agua Vista St., Oakland. **$45,000.** A. Froberg, 3454 Harlan St., archt.

Calif., Berkeley—WAREHOUSE—Northrup King & Co., 8 and Parker Sts., 1 story, 80x110 ft. warehouse, to F. A. Stead, 3206 Boise St. **$42,387.** J. W. Plachek, Mercantile Bldg., archt.

Calif., Los Angeles—GARAGE—Flower Realty Co., c/o E. T. Heitschmidt, archt., Subway Terminal Bldg., 417 S. Hill St., 1 story, 100x300 ft., brick garage and delivery service bldg., 940 Sunbury Court, to S. N. Benjamin, 718 E. 16 St., approx. **$75,000.**

Calif., Los Angeles—MARKET—University of Southern Calif., 3551 University St., market on 7½ acre site, 3 St. and Fairfax Ave., to Myers Bros., 3407 San Fernando Rd. Est. over **$40,000.** R. H. Crawford, 9397 Wilshire Blvd., Beverly Hills, archt. CD 9/15—ENR 9/18.

Calif., Oakland—PLANT—Pacific Coast Aggregates, 85 2 St., San Francisco, concrete batch plant, own forces. **$45,000.**

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INDUSTRIAL BLDGS. (Contracts Awarded, Cont'd.)

Calif., San Francisco—STORAGE—General Brewing Corp., 2601 Newhall St., rein.-con. addns. for storage units, to Cahill Bros., 206 Sansome St., **$40,500.** F. H. Meyer, Kohl Bldg., archt.

Colo., Denver—PLANT—Colorado Animal By-Products Mfg. Co., M. Fiedelman, secy., 4400 Brighton Blvd., 1 story, 100x223 ft. wool carding plant, to Dutton, Kendall & Hunt, Inc., c/o owners. **$40,000.**

Conn., Meriden—GARAGE, etc.—Connecticut Co., 127 Pratt St., 1 story, 60x150 ft. garage, 1 story, 30x70 ft. office, brick, steel, concrete, to Paterson Constr. Co., Inc., 66 Anderson St., New Haven. Est. **$45,000.** Bids 9/13. CD 9/5—ENR 9/11.

Conn., New Haven—FACTORY—Wire Rope of America, Inc., 464 Congress Ave., 1 story, 112x150 ft., brick, steel manufacturing unit with storage space, separate contracts. **$46,670.** L. Caproni, 1221 Chapel St., engr.

Conn., Waterbury — FACTORY — American Brass Co., Main St., 1 story, 75x110 ft., brick, steel factory addn., to Torrington Bldg. Co., 187 Church St., Torrington. **$40,000.** CD 9/12—ENR 9/18.

Conn., Waterbury—FACTORY—Scovill Mfg. Co., 99 Mill St., 1 story, 44x182 ft. brick, steel, concrete factory addn., Silver and East Main St., to Turner Constr. Co., 38 Newbury St., Boston, Mass. Est. **$40,000.** H. L. Thompson, 129 Pine St., Waterbury, engr.

Md., Ellicott City—MACHINE SHOP, etc.—Baltimore Properties, Inc., 313 E. Baltimore St., Baltimore, machine shop, laboratory, office bldg., to Consolidated Eng. Co., 20 E. Franklin St., Baltimore. **$185,000.** CD 7/16—ENR 7/31.

★**Md. Sparrows Point (br. Baltimore)**—ELECTRIC GENERATING PLANT—Consolidated Gas, Electric Light & Power Co. of Baltimore, Lexington Bldg., Baltimore, electric generating plant, 90x103 ft. turbine room building, 88x107 ft., boiler house, 90x103 ft. service bldg., 67,000 hp. generator, Sparrows Point R. R. and Patapsco Ave. Owner builds. Buildings **$400,000,** equip. **$4,000,000.**

Md., Sparrows Point (br. Baltimore)—SERVICE—Bethlehem Steel Co., Sparrows Point, Md., and E. 3 St., Bethlehem, Pa., 1 story, 50x93 ft., brick service bldg. for coke ovens and brick, steel, etc. Warehouses and service bldg. for steel mill, separate contracts, **$80,000.**

Mass., Fitchburg—BOILER PLANT—Fitchburg Gas & Electric Co., 655 Main St., 1 story, 48x50 ft., brick, steel, concrete boiler plant addn., to Wiley & Foss, Central St. Est. **$50,000.** Bids 9/22. CD 9/18—ENR 9/25.

Mass., Worcester—FORGE UNIT—Crompton & Knowles Loom Wks., 93 Grand St., 1 story, 65x125 ft., brick, steel forge unit addn., alterations, to E. Whitehead, Inc., Union St. Est. **$40,000.**

†**Mich., Ferndale (br. Detroit)**—MACHINE SHOP—Standard Reamer & Tool Co., 2620 Elmwood St., Detroit, design and construction 1 story, brick, steel, concrete machine shop, plain fdn., to The Austin Co., 429 Curtis Bldg., Detroit. Est. **$40,000.**

Minn., Minneapolis—SHOP—Minneapolis, St. Paul & Sault Ste. Marie Ry. Co., T. Z. Krumm, ch. engr., 1st Natl. Soo Line Bldg., 1 story, 123x175 ft., steel frame, brick coach shop, Shoreham Yards, trucking walk connecting, to Stahr-Burgum Co., 903 Wesley Temple Bldg., about **$40,000.** Bids 9/24.

Minn., St. Paul—WAREHOUSE, etc.—Western Fruit Express Co., 1308 Railroad Blvd., 76x103 ft. frame ice warehouse and platform, 923 N. Snelling Ave. Owner builds. About **$45,000.**

Mo., Kansas City—WAREHOUSE—Watson Bros. Transportation Co., 802 S. 14 St., Omaha, Neb., warehouse and docks, to Morris Hoffman Constr. Co., Victor Bldg., Kansas City, Mo. **$40,000.** C. Kivett, 1016 Baltimore Ave., Kansas City, Mo., archt.

Mo., St. Louis — SALES and SERVICE — I. and B. Holtzman, 2700 N. Bway., and Missouri-Illinois Tractor & Equipment Co., c/o G. L. Walter, pres., J. D. Adams Co., 511 Withers Ave., lessee, 1 story, part bsmnt., brick sales and service bldg., McKissock and Withers Aves., to Murch-Jarvis Co., 943 Cotton Belt Bldg., 4 and Pine Sts. Est. **$40,000** incl. equip. H. S. Van Hoefen, 943 Cotton Belt Bldg., archt.

Neb., Omaha—BOILER HOUSE—Metropolitan Utilities Dist., W. S. Byrne, genl. mgr., 18 and Harney Sts., boiler house, own forces. **$45,000.** CD 12/10—ENR 12/12.

N. J., Bloomfield—STORAGE—General Electric Co., 5 Lawrence St., altering 40x400 ft., steel, frame mezzanine Storage Bldg. 1 Lawrence St., to Becker Constr. Co., 361 Grove St., Newark, **$40,000.** W. J. Chapman, 5 Lawrence St., engr.

N. J., Clifton—TERMINAL—Passaic Athenia Bus Co., 541 Main Ave., 1 story, part bsmnt., 75x100 ft. and 50x50 ft., concrete block, brick bus terminal, and garage, to Hugh Montague & Sons Co., 880 Bergen Ave., Jersey City. CD 8/21—ENR 8/28.

N. J., Jersey City—WAREHOUSE—Clorox Chemical Co., 51 Pacific Ave., 1 and 2 story, 86x259 ft., rein.-con., steel warehouse addn., to Bonanno Constr. Co., Inc., 8533 Tonnelle Ave., North Bergen. **$153,000.** CD 9/23—ENR 9/25.

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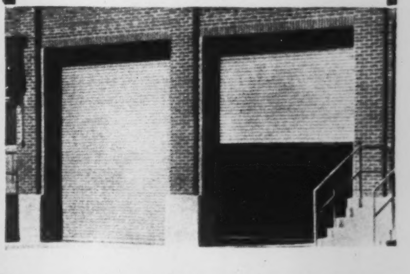

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Under Defense speed-up conditions, good sales management needs fast news service. The Construction Daily's fast news service includes:

1. A $12,000,000 bag loading plant in the South reported by Washington, Aug. 9, awarded to Industrial contractor to operate.

   ENR CONSTRUCTION DAILY reported both industrial operator and construction contractor on this job July 29, 12 days earlier.

2. An $8,000,000 ordnance works in Arkansas reported by Washington, July 17, awarded to industrial operator; construction engineer and contractor reported July 28.

   Both the engineer-contractor and the industrial operator reported by the CONSTRUCTION DAILY July 1, 16 and 27 days earlier respectively.

3. A $21,000,000 ordnance plant contract announced in Washington, July 21.

   This news reported in the Daily, July 15, 6 days ahead.

4. A $4,000,000 ordnance plant in Indiana reported July 21.

   The DAILY reported it June 19, a month earlier.

5. Basic Flying School contract, $4,000,000 reported in Washington, July 21.

   Reported in the ENR CONSTRUCTION DAILY July 3, 17 days ahead.

6. $10,000,000 Aviation Mechanics School, reported in Washington, July 17.

   Reported in the DAILY, June 20, a 4 weeks time advantage.

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INDUSTRIAL BLDGS. (Contracts Awarded, Cont'd.)

N. J., Pompton Lakes—PLANT—E. I. Du Pont de Nemours & Co., 71 Buckingham Pl., Perth Amboy, 2 story, L-shaped, 64x86 ft., brick, concrete chemical bldg., 1 story, part bsmnt., 34x146 ft., irregular sized, tile, brick change and locker bldg., Cannonball Rd., to Eastern Constr. Co., 705 Greenwood Ave., Trenton.

N. Y., Long Island City—FACTORY, etc.—Pepsi Cola Co., 33 St. and 48 Ave., 2 story factory and warehouse, to Ryan Contg. Co., 341 E. 79 St., New York. Est. **$200,000.** CD 9/25—ENR 10/2.

N. Y., Newark—PLANT—Hallagan Mfg. Co., Hoffman St., 2 story, 80x110 ft. warehouse, to George Kircher & Sons, 1384 Clifford Ave., Rochester. Est. **$40,000.** CD 9/4—ENR 9/11.

N. Y., Niagara Falls — LABORATORY — Electro Metallurgical Co., 137-47 St., 2 story 47x121 ft. laboratory, to Walter S. Johnson Bldg. Co., 2532 Hyde Park Blvd. G. L. Lardie, c/o owner, engr.

N. Y., North Tonawanda—SHOP—Meyers Lumber Co., Inc., Island St., 1 story, 70x150 ft. planing mill and woodworking shop, own forces. **$50,000.** CD 9/23—ENR 9/25.

★ **N. Y., Rochester**—PLANT—Eastman Kodak Co., 1447 St. Paul St., 4 story, 62x215 ft. plant addn., to A. W. Hopeman & Sons Co., 569 Lyell Ave. Est. **$500,000.**

O., Cleveland—FACTORY, etc.—Black Boring & Machine Co., J. Meyers, in charge, 4909 Luther Ave., 2 story, 80x100 ft., brick, steel factory and office bldg., to Chas. E. Lewis & Son, 1200 Green Rd. S., Euclid. Est. **$40,000.** J. W. Thomas, 3868 Carnegie Ave., archt. Awarded 9/26. CD 7/14—ENR 7/17.

O., Cleveland—GARAGE, etc.—B. W. Blaushild Motors, Inc., B. W. Blaushild, in charge, 14309 Kinsman Rd., 1 story, 100x165 ft., brick, steel garage and repair shop, to Markowitz Bros., 3405 De Sota Ave. Est. **$50,000.** H. F. Bremmer, Prospect-Fourth Bldg., archt. Awarded 9/29.

O., Cleveland—MACHINE SHOPS—Cleveland Pneumatic Tool Co., L. W. Greve, pres., E. 77 St. and Osage Ave., 1 story, 53x180 ft., top addn. to Machine Shop Bldg. 2, 3 story, 120 ft. side addn to machine shop bldg. 9, brick, steel, concrete, to Hadlock Krill Co., 2169 E. 38 St. Est. **$200,000.** Bids 6/5, awarded 9/25. CD 6/4—ENR 6/12.

O., Cleveland—FACTORY—Osborn Mfg. Co., 5401 Hamilton Ave., 1 story, 40x107 ft. factory addn., to G. C. Rutland, Lost Nation Rd., Willoughby. Est. **$40,000.** Awarded 9/24. J. Wallace Green, Johnson Bldg., Painesville, engr.

O., Cleveland—FACTORY—Tube Craft, Inc., J. W. Held, Pres., 1328 W. 78 St., 1 story, 43x105 ft., brick, steel factory, to Bolton-Pratt Co., 1276 W. 3 St. Est. **$40,000.**

O., Cleveland—FACTORY, etc.—S. K. Wellman Co., S. K. Wellman, pres., 1381 E. 49 St., 1 story, 155x176 ft., brick, steel factory and office addn., to Alger-Rau, Inc., 12434 Cedar Rd. Est. **$100,000.** Awarded 9/26. C. B. Rowley & Associates, Keith Bldg., archts.

O., Lisbon—FACTORY—R. Thomas & Sons Co., 1 story, 40x80 ft., brick, steel, concrete factory addn., to Nellis Constr. Co., East Liverpool. **$40,000.** Awarded 9/29.

Ore., Salem—WAREHOUSE—Oregon Pulp & Paper Co., 3 story warehouse, to Viesko & Hannaman, Salem. Est. **$100,000.** A. P. Cramer, Bedell Bldg., Portland, engr.

Pa., Aliquippa — WAREHOUSE — National Can Corp., S. L. Buschman, pres., 110 E. 42 St., New York, N. Y., 1 and 2 story, bsmnt., 150x300 ft., brick, steel warehouse, to Brown & Matthews, Inc., 122 E. 42 St., New York, N. Y. Est. **$350,000.**

Pa., Greenville—ENGINE PIT—Bessemer & Lake Erie R. R. Co., F. R. Layng, ch. engr., Greenville, rein.-con. engine pit bldg., to L. A. Wells Constr. Co., Schofield Bldg., Cleveland, O. Est. **$50,000.**

Pa., Sharon—WAREHOUSE — National Can Corp., 110 E. 42 St., New York, N. Y., warehouse, to Brown & Matthews, Inc., 122 E. 42 St., New York, N. Y. Est. **$175,000.**

S. D., Aberdeen—WAREHOUSE—Deere & Webber Co., 600 Washington Ave. N., Minneapolis, Minn., 1 story, 99x252 ft. tile warehouse, to F. E. Peterson, Sexton Bldg., Aberdeen. Est. **$40,000.**

Tex., Llano—MILL—Honey Creek Mine, c/o G. W. Allen, Llano, construction, imprvs. toward reopening ore processing mill, Honey Creek, near here, day labor. Approx. **$58,000.** CD 10/1.

Wis., Green Bay—POWER PLANT—Wisconsin Pub. Serv. Comn., Bellin Bldg., superstructure, 1 story, 82x176 ft, brick, concrete, steel power plant addn., to C. R. Meyer & Sons Co., 50 State St., Oshkosh. Total est. **$2,600,000.** CD 4/9—ENR 4/17.

Alaska, Ketchikan—WAREHOUSE—H. F. Brennan Co., Ketchikan, 2 story, 80x149x179 ft. timber warehouse, day labor. **$50,000.** CD 9/17—ENR 9/5.

B. C., Vancouver—PLANT—Eburne Saw Mills, Ltd., 9149 Hudson St., remodeling plant, day labor. **$140,000.**

B. C., Vancouver—PLANT—Sorg Pulp Co., Ltd., 1500 Royal Bank Bldg., several new bldgs., extens., imprvs. existing structures, to Dominion Constr. Co., Ltd., 509 Richards St., about **$75,000.** CD 8/26—ENR 8/28.

★ **Ont., Chatham**—PLANT—Chrysler Corp., Ltd., 300 Tecumseh Rd., Windsor, 1 story, 200x212 ft., brick, steel plant exten., concrete fdn., to Carter-Halls-Aldinger Co., Ltd., 419 Cherry St., Toronto. Est. **$1,000,000.** CD 8/29—ENR 9/4.

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Bids: October 22 (578)

Sewage System Improvements

VILLAGE OF BALLSTON SPA, N. Y.

Sealed bids for the construction of a 30 inch outfall sewer, a 16 inch cast iron force main, sewage pump, sewage disintegrator, and improvements to the sewage pumping station will be received by the Board of Trustees, at the Village Office until seven-thirty P.M. Eastern Standard Time, on the 22nd day of October, 1941, and then publicly opened and read aloud.

The work will be divided into two sections as follows: Section 1—Outfall Sewer and Force Main; Section 2—Sewage Pump, Sewage Disintegrator and Improvements to the Sewage Pumping Station. Contractors may bid on either or both Sections.

The Information for Bidders, Form of Bid, Form of Contract, Plans, Specifications and Performance Bond may be examined at the Office of the Village Clerk, Village of Ballston Spa and at the office of Solomon & Keis, Consulting Engineers, 257 Broadway, Troy, N. Y., copies thereof may be obtained at the said office of Solomon & Keis upon payment of $25.00 for each set. Any bidder upon returning such set promptly and in good condition, will be refunded his payment, and any non-bidder upon so returning such set will be refunded $20.00.

The Board of Trustees of the Village of Ballston Spa, reserves the right to Waive any informalities in or to reject any or all bids.

Each bidder must deposit with his bid security in an amount of not less than five percentum (5%) of the base bid in the form and subject to the conditions provided in the Information for Bidders.

No bidder may withdraw his bid within 45 days after the actual date of the opening thereof.

September 29, 1941.

Donald D. Hall
Village Clerk.

Bids: October 22 (568)

Dam Construction

WASHINGTON SUBURBAN SANITARY COMMISSION
CONSTRUCTION OF BRIGHTON DAM, PATUXENT RIVER, MARYLAND
CONTRACT NO. 127-W

Notice is hereby given that sealed bids, in duplicate, will be received at the office of the Washington Suburban Sanitary Commission, Owens Avenue, Hyattsville, Maryland, until 3:00 P.M., Eastern Standard Time, Wednesday, October 22, 1941, and then publicly opened and read, for constructing the Brighton Dam and 1.1 miles of gravel approach roadway on the Patuxent River about 20 miles north of Washington, D. C. The principal items of work and the estimated quantities involved are approximately as follows:

For Dam		
All classes of concrete	17,000	Cu. Yds.
Common excavation	25,000	Cu. Yds.
Rock excavation	8,000	Cu. Yds.
Reinforcing steel	800,000	Lbs.
Placing structural steel, gates, valves, machinery, etc.	350,000	Lbs.
For Gravel Approach Roadway		
Common Excavation	40,800	Cu. Yds.
Rock Excavation	100	Cu. Yds.
Earth Embankment	17,340	Cu. Yds.
Gravel Roadway	12,880	Sq. Yds.

Materials to be furnished by the contractor and those to be furnished by the Commission are described in the specifications, which will be part of the contract. Any unbalanced bid which, in the opinion of the Commission, jeopardizes the interests of the Commission will be subject to rejection for that reason. The Commission further reserves the right to waive any informalities in or to reject any or all bids. Bid security in a penal sum approximately equal to and not les than 5% of the total amount of the bid will be required. A performance bond and a payment bond with good and sufficient surety will be required in a penal sum approximately equal to and not less than 100% of the full amount of the consideration of the contract. Plans, specifications and bidding papers may be obtained from Harry R. Hall, Chief Engineer of the Commission in Hyattsville, Maryland, or at the office of the Commission's consulting Engineers, Ambursen Engineering Corporation, 295 Madison Avenue, New York City, beginning October 1, 1941, by the payment of $50 for each set. Any bidder upon returning such set in good condition to the Consulting Engineers within ten days after the date of opening of bids, will be refunded his deposit. Non-bidders upon returning such set in good condition within ten days after the date of opening of bids, will be refunded $25. No bidder may withdraw his bid within thirty days after the actual date of the opening thereof.

Perry Boswell
J. Donald Clagett
Frank B. Smith
Commissioners

Ambursen Engineering Corporation
Consulting Engineers, New York

Bids: October 27 (586)

Water Pipe Line

CONTRACT 67
CONSTRUCTING THE
NEPAUG PIPE LINE NO. 2

SEALED PROPOSALS addressed to The Board of Contract and Supply of The Metropolitan District and endorsed "PROPOSAL FOR THE CONSTRUCTION OF THE NEPAUG PIPE LINE NO. 2 IN THE TOWNS OF AVON AND FARMINGTON, CONNECTICUT", will be received at the Executive Office of The Metropolitan District at the Municipal Building, 550 Main Street, Hartford, Connecticut, until 2:15 o'clock P.M., Eastern Standard Time, Monday, October 27, 1941, at which time and place they will be publicly opened and read.

After the bids are opened and read they will be taken under advisement and the award of the contract, if awarded, will be made as soon thereafter as practicable.

The work to be done includes furnishing and installing material for about seven (7) miles of pipe line starting at the junction of the Collinsville By-pass pipe line and the present Nepaug pipe line about 8,000 feet south of the Village of Collinsville and extending generally in an easterly direction to the west end of the present Nepaug conduit about 7,000 feet north of the Town of Farmington.

Alternate proposals will be considered on the basis of 36-inch reinforced concrete cylinder pipe and 37½-inch electrically welded steel pipe, double dipped in asphalt enamel.

Plans and specifications may be obtained on and after October 9, 1941, at the Office of the Manager and Chief Engineer of The Water Bureau of The Metropolitan District, 1026 Main Street, Hartford, Connecticut, on deposit of ten dollars ($10), in cash or certified or cashier's check, made payable to The Water Bureau of The Metropolitan District, which amount will be refunded if both are returned in good order within one month of date of opening of bids. No deposits will be refunded after that time. Specifications used in making a bid will be considered as returned.

Original scale blueprints may be obtained for cash payment, or certified or cashier's check, of five dollars ($5) per set (15 plans) additional for which there will be no refund.

Each proposal must be accompanied by a certified or cashier's check for an amount covering not less than ten per cent. (10%) of the total amount bid, made payable to The Metropolitan District, and a satisfactory surety bond, as stated in the Information for Bidders, for the total amount bid will be required of the successful bidder for the faithful performance of the contract.

The right is reserved to accept any bid, whether or not the lowest, or to reject any or all bids as the interest of the District may appear to require.

THE METROPOLITAN DISTRICT
BOARD OF CONTRACT AND SUPPLY,
By Richard Dillon, Clerk.
Hartford, Connecticut,
September 26, 1941.

U. S. Government

UNITED STATES DEPARTMENT OF THE INTERIOR, Bureau of Reclamation, Washington, D. C., September 26, 1941. Sealed bids (Readvertisement of part of Specifications No. 977) will be received at the office of the U. S. Bureau of Reclamation, Old Post Office Building, Sacramento, California, until 10 a.m., October 17, 1941, and will at that hour be publicly opened for furnishing labor and materials and performing all work for *clearing part of the Shasta Reservoir site*, Kennett division, Central Valley project, California. The work is located north of Redding, California, and is divided into twelve schedules with a total area of approximately 10,000 acres. The contractor shall begin work within thirty (30) calendar days after date of receipt of notice to proceed, shall complete all clearing below elevation 830 within three hundred and thirty (330) calendar days, and shall complete all of the work within six hundred and ninety (690) calendar days from the date of receipt of such notice. Guarantee will be required with each bid in amount not less than 10 percent of the amount of the bid. Performance bond will be required in an amount not less than 50 percent of the estimated aggregate payments to be made under the contract. Where the total amount payable by the terms of the contract is not more than $1,000,000, a payment bond will be required in the sum of one-half of the total amount payable by the terms of the contract. Where the total amount payable by the terms of the contract is more than $1,000,000, the payment bond shall be in the sum of 40 percent of the total amount payable by the terms of the contract. Partial payments will be made monthly. Liquidated damages for delay will be twenty-five dollars ($25) per day. No charge to prospective bidders for copies of the specifications and drawings; to others $0.50 per copy, not returnable. For particulars, address the Bureau of Reclamation at Sacramento, California; Denver, Colorado; or Washington, D. C. H. W. Bashore, Acting Commissioner. (588)

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